

**EPA Superfund
Record of Decision:**

**MIDCO II
EPA ID: IND980679559
OU 01
GARY, IN
06/30/1989**

THE ORIGINAL RELIEF OF THIS SITE, AS WELL AS THE SURROUNDING AREA, INCLUDED ALTERNATING EAST AND WEST TRENDING, RIDGES AND SWALES. HOWEVER, THE TOPOGRAPHY OF THE SITE, AS WELL AS THE SURROUNDING AREA, HAS BEEN EXTENSIVELY MODIFIED BY MAN AND IS ONLY LOCALLY PRESERVED. THE SITE ITSELF IS NOW RELATIVELY FLAT AND IS UNDERLAIN BY FILL MATERIAL AND SAND. SINCE A SURFACE REMOVAL ACTION HAS BEEN COMPLETED, THE REMAINING CONTAMINANTS OF CONCERN ARE IN SUBSURFACE SOILS AND MATERIALS, AND THE GROUND WATER.

ECOLOGY:

THERE ARE A NUMBER OF RELATIVELY UNDISTURBED, STATE-DESIGNATED NATURE PRESERVES WITHIN A THREE-MILE RADIUS OF THE SITE. THESE AREAS AS WELL AS OTHER RELATIVELY UNDISTURBED SITES, PROVIDE HABITAT FOR A WIDE VARIETY OF MIGRATORY AND RESIDENT WILDLIFE. THE SOUTHERN END OF LAKE MICHIGAN AND NEARBY HABITATS ARE A CONVERGENCE AREA FOR MIGRATORY BIRDS FOLLOWING THE NORTH-SOUTH BOUNDARY OF THE LAKE.

WETLAND VEGETATION EXISTS IN THE DITCH THAT IS ADJACENT TO THE NORTHEAST BORDER OF MIDCO II. MALLARD BROODS WERE OBSERVED IN THIS DITCH. THE MALLARD HAS BEEN DESIGNATED AS A SPECIES OF SPECIAL EMPHASIS BY THE US FISH AND WILDLIFE SERVICE. MIDCO II IS ALSO WITHIN THE RANGE OF THE FEDERALLY-ENDANGERED INDIANA BAT. IN ADDITION, BLANDING'S TURTLE, A STATE OF INDIANA-DESIGNATED ENDANGERED SPECIES WAS OBSERVED NEAR MIDCO II.

RABBITS, ROBINS AND RED-WINGED BLACK BIRDS, CRAYFISH AND SNAPPING TURTLES WERE ALSO OBSERVED NEAR THE SITE.

GROUND WATER:

THE SURFICIAL SAND AQUIFER (CALUMET AQUIFER) AT THE MIDCO II SITE EXTENDS TO A DEPTH OF 45 TO 50 FEET BENEATH THE SITE. HISTORICALLY, THE CALUMET AQUIFER WAS AN IMPORTANT GROUND WATER SOURCE BUT CURRENT AQUIFER USE IN THE VICINITY OF THE MIDCO II SITE IS LIMITED. THE CALUMET AQUIFER IS VERY SUSCEPTIBLE TO CONTAMINATION FROM SURFACE SOURCES BECAUSE OF THE HIGH WATER TABLE IN THE AREA AND THE VERY PERMEABLE SANDY NATURE OF THE SURFACE SOILS. AT A BORING ON THE AIRPORT PROPERTY, 62 FEET OF SOFT SILTY CLAY AND SILTY CLAY LOAM WERE ENCOUNTERED BENEATH THE CALUMET AQUIFER OVERLYING AS MUCH AS 6 FEET OF HARD, SILTY TILL. AVAILABLE TEST DATA SUGGEST THAT THE BEDROCK AQUIFER BENEATH THE SITE CONTAINS ABUNDANT PETROLEUM HYDROCARBON. THE BORING PENETRATED ABOUT 40 FEET OF HEAVY OIL-SATURATED VUGULAR DOLOMITE.

FIGURE 2 INDICATES THE GROUND WATER FLOW IN THE CALUMET AQUIFER AT THE SITE. A SUBTLE BUT PERSISTENT GROUND WATER HIGH RUNS EAST AND WEST THROUGH THE CENTER OF THE SITE. BELOW THE NORTHEAST PART OF THE SITE, THE GROUND WATER MIGRATES NORTHEAST INTO THE ADJACENT DITCH. BELOW THE SOUTHWEST PART OF THE SITE, THE GROUND WATER MIGRATES SOUTH UNDER THE GARY CITY AIRPORT AND EVENTUALLY INTO THE GRAND CALUMET RIVER. BECAUSE OF THE VERY LOW GROUND WATER GRADIENT, THE ESTIMATED VELOCITY OF THE GROUND WATER IS ONLY 21 FEET PER YEAR TO THE NORTHEAST AND 16 FEET PER YEAR TO THE SOUTH. THE ESTIMATED GROUND WATER FLOW RATE THROUGH THE CLAY CONFINING LAYER BELOW THE CALUMET AQUIFER IS 3 FEET PER YEAR.

THE PREDOMINANT SOURCE OF WATER FOR BOTH POTABLE AND NON-POTABLE USES IN THE MIDCO II AREA IS LAKE MICHIGAN. THE WELL INVENTORY CONDUCTED IN THE REMEDIAL INVESTIGATION IDENTIFIED 14 WELLS WITHIN ONE MILE OF THE SITE. THREE ARE BEDROCK WELLS USED BY LOCAL BUSINESSES AND THE AIRPORT FOR NON-DRINKING PURPOSES. ELEVEN ARE SCREENED IN THE CALUMET AQUIFER. NINE OF THESE ARE USED BY LOCAL BUSINESSES FOR NON-DRINKING PURPOSES, AND TWO ARE RESIDENTIAL WELLS THAT ARE NO LONGER IN USE, ALTHOUGH THEY WERE PREVIOUSLY USED FOR DRINKING.

SURFACE DRAINAGE

SURFACE DRAINAGE FROM A SMALL PORTION (LESS THAN 1/2 ACRE) OF THE NORTHEAST END OF THE SITE FLOWS DIRECTLY INTO THE DITCH THAT IS NORTHEAST OF THE SITE. OVER THE REST OF THE SITE, SLOPES ARE 0-2 PERCENT, AND THERE ARE NO OTHER DRAINAGE CHANNELS. INSTEAD, THE WATER TEMPORARILY PONDS IN THE CENTER OF THE SITE WHERE IT EVENTUALLY EVAPORATES OR RECHARGES THE GROUND WATER. SURFACE DRAINAGE FROM THE ADJACENT SCRAP YARD AND INDUSTRIAL HIGHWAY ALSO FLOW INTO THESE TEMPORARY PONDS ON MIDCO II.

THE WATER LEVEL IN THE DITCH IS INTIMATELY CONNECTED TO THE LEVEL IN THE SURFICIAL AQUIFER. THE DITCH ACTS AS A GROUND WATER SINK, AND GROUND WATER RECHARGE FROM MIDCO II CONTRIBUTES A SUBSTANTIAL AMOUNT TO ITS FLOW.

THE DITCH FLOWS TO THE SOUTHEAST INTO THE GRAND CALUMET RIVER, WHICH IS 1-1/4 MILE SOUTHEAST OF THE SITE. THE GRADIENT IN THE DITCH IS VERY LOW AND THE SURFACE DRAINAGE AREA IS MINIMAL. RUN-OFF IS LOW AND FLOW IN THE DITCH IS PROBABLY LARGELY GROUND WATER RECHARGE. IN ADDITION, VEGETATION IN THE DITCH SLOWS THE FLOW RATE. THESE CONDITIONS SUGGEST MINIMAL FLOW VELOCITIES AND GREATLY REDUCED SEDIMENT TRANSPORT.

#SHEA

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

WASTE OPERATIONS, INCLUDING DRUM STORAGE, WERE INITIATED AT MIDCO II DURING THE SUMMER OF 1976 BY THE SAME OPERATOR AS AT MIDCO I. IN JANUARY 1977, (FOLLOWING A MAJOR FIRE AT MIDCO I) MIDWEST INDUSTRIAL WASTE DISPOSAL COMPANY WAS INCORPORATED OSTENSIBLY FOR OPERATING THE MIDCO II SITE, AND THE OPERATIONS AT MIDCO I WERE TRANSFERRED TO MIDCO II. OPERATIONS INCLUDED TEMPORARY BULK LIQUID AND DRUM STORAGE OF WASTE AND RECLAIMABLE MATERIALS, NEUTRALIZATION OF ACIDS AND CAUSTICS, AND ON-SITE DISPOSAL VIA DUMPING INTO ON-SITE PITS, WHICH ALLOWED PERCOLATION INTO THE GROUND WATER. ONE OF THESE PITS, CALLED THE FILTER PIT, HAD AN OVERFLOW PIPE LEADING INTO THE DITCH (FIGURE 3). BY APRIL 1977, APPROXIMATELY 12,000 TO 15,000 55-GALLON DRUMS OF WASTE MATERIALS WERE STORED ON SITE. IN ADDITION, APPROXIMATELY 10 ABOVE AND BELOW GROUND TANKS WERE ACCUMULATED AND USED TO HOLD WASTES. THE DRUMS WERE STACKED THREE HIGH, AND ALONG WITH THE TANKS, WERE BADLY DETERIORATED AND LEAKING. THE WASTES INCLUDED OILS, OIL SLUDGES, CHLORINATED SOLVENTS, PAINT SOLVENTS, PAINT SLUDGES, ACIDS, AND SPENT CYANIDES. ALSO PRESENT WERE WASTE SATURATED SOILS CAUSED BY LEAKING DRUMS AND SPILLAGE, AN OPEN DUMP CONSISTING MAINLY OF DRUMS, TIRES, AND VARIOUS WOOD WASTES, AND AN EXCAVATED PIT CONTAINING UNIDENTIFIED SLUDGES.

IN MAY 1977, THE STREAM POLLUTION CONTROL BOARD CHARGED MIDCO II WITH IMPROPER STORAGE OF CYANIDE WASTE, OPERATION OF AN OPEN DUMP, FAILURE TO OBTAIN A CONSTRUCTION OR OPERATION PERMIT, AND AN IMPROPER DISCHARGE OF SOLVENTS, PAINT SLUDGES, ACIDS, AND SPENT CYANIDES.

ON AUGUST 15, 1977, A FIRE AT MIDCO II DESTROYED EQUIPMENT, BUILDINGS, AND AN ESTIMATED 50,000 TO 60,000 DRUMS, INCLUDING DRUMS OF CYANIDE STORED IN A BUILDING. A SUBSTANTIAL NUMBER OF DRUMS CONTAINING CHEMICAL WASTES SURVIVED THE FIRE, ALTHOUGH MOST WERE IN A VERY DETERIORATED CONDITION. THIS INCLUDED 75-100 DRUMS OF CYANIDE.

ON FEBRUARY 24, 1978, THE LAKE COUNTY CIRCUIT COURT ORDERED MIDWEST SOLVENT DISPOSAL COMPANY TO REMOVE AND PROPERLY DISPOSE OF DRUMS OF CYANIDE AND OTHER INDUSTRIAL WASTES FROM MIDCO I AND MIDCO II WITHIN 90 DAYS. THIS ORDER WAS NEVER OBEYED.

IN AUGUST 1979, THE US EPA SAMPLED A PAINT TANK, EIGHT BARRELS, THE DRAINAGE DITCH, DRAINAGE DITCH SEDIMENT, AND RESIDUE ALONG THE DITCH. BASED ON THESE RESULTS, THE UNITED STATES FILED A COMPLAINT IN THE FEDERAL DISTRICT COURT IN HAMMOND, INDIANA UNDER SECTION 7003 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (CIVIL ACTION NO H-79-556). A PRELIMINARY INJUNCTION AND TEMPORARY RESTRAINING ORDER WAS GRANTED ON JANUARY 31, 1980 THAT DIRECTED A MIDCO II PROPERTY OWNER TO REPORT ON EFFORTS TO REMOVE SURFACE WASTES FROM MIDCO II. ON DECEMBER 4, 1980, THE OPERATORS OF MIDWEST SOLVENT DISPOSAL COMPANY WERE ORDERED TO SUBMIT TO US EPA, A PLAN FOR THE REMOVAL OF ALL WASTES STORED ON MIDCO II, AND TO DESIGN A PLAN TO DETERMINE THE NATURE AND EXTENT OF SOIL AND GROUND WATER CONTAMINATION.

HOWEVER, THESE COURT ACTIONS WERE INEFFECTIVE, AND IN FEBRUARY 1981, THE US EPA CONDUCTED AN INVESTIGATION TO EVALUATE THE POSSIBLE PRESENCE OF AN ACUTE HAZARD TO HUMAN HEALTH OR THE ENVIRONMENT WHICH COULD BE REMEDIED BY SHORT-TERM SAFEGUARDS. IN RESPONSE TO SITE CONDITIONS, THE US EPA FUNDED THE INSTALLATION OF A 10-FOOT HIGH FENCE AROUND THE SITE. THE FENCE WAS COMPLETED IN AUGUST 1981.

THE US EPA FUNDED A HYDROGEOLOGIC STUDY OF THE SITE DURING 1981 TO 1983, IN ORDER TO IDENTIFY CONTAMINANTS PRESENT IN THE SOIL AND GROUND WATER, DETERMINE THE GROUND WATER FLOW CHARACTERISTICS, AND ASCERTAIN THE EXTENT OF CONTAMINATION ATTRIBUTABLE TO SITE OPERATIONS.

ON JANUARY 19, 1984, THE UNITED STATES FILED ITS FIRST AMENDED COMPLAINT FOR CIVIL ACTION NO. H-79-556, ADDING CLAIMS FOR INJUNCTIVE RELIEF UNDER SECTION 106 OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA) AND FOR RECOVERY OF RESPONSE COSTS INCURRED BY THE UNITED STATES UNDER SECTION 107 OF CERCLA, AND ADDING GENERATOR DEFENDANTS.

FROM FEBRUARY TO MARCH 1984, THE US EPA CONDUCTED EMERGENCY REMOVAL ACTIVITIES, INCLUDING THE REPAIR AND EXTENSION OF THE SITE FENCE AND THE REMOVAL OF 413 DRUMS OF WASTE. FROM JANUARY - MARCH 1985, US EPA REMOVED THE REMAINING DRUMS (EXCEPT FOR 5 DRUMS CONTAINING PCB CONTAMINATED SOILS), TANKS AND DEBRIS FROM THE SURFACE OF THE SITE.

AT THE END OF JULY 1985, THE US EPA BEGAN EMERGENCY REMOVAL OF THE SLUDGE PIT AND FILTER BED CONTENTS (FIGURE 3). THESE MATERIALS WERE HIGHLY CONTAMINATED WITH PCBS AND CYANIDE. THE MATERIALS WERE EXCAVATED AND PLACED IN SEPARATE PILES ON SITE. THE SLUDGE PIT WAS BACKFILLED WITH CRUSHED STONE AND THE FILTER BED WAS BACKFILLED WITH CRUSHED STONE AND DEBRIS FROM THE SITE, SUCH AS OLD TIRES, TIRE RIMS AND CONSTRUCTION

WASTE. IN DECEMBER 1985, AND JANUARY 1986, THE PCB CONTAMINATED SOIL PILE WAS REMOVED AND DISPOSED OF IN AN OFF-SITE HAZARDOUS WASTE LANDFILL, AND MOST OF THE CYANIDE CONTAMINATED PILE WAS REMOVED.

MIDCO II WAS PLACED ON THE NATIONAL PRIORITIES LIST (NPL) IN OCTOBER 1984. THE NPL IS A LIST OF ABANDONED OR UNCONTROLLED HAZARDOUS WASTE SITES THAT ARE ELIGIBLE FOR INVESTIGATION AND REMEDIATION UNDER CERCLA.

THE US EPA COMPLETED A WORK PLAN FOR A REMEDIAL INVESTIGATION FEASIBILITY STUDY (RI/FS) FOR THIS SITE IN FEBRUARY 1985. THE PURPOSE OF THE RI WAS TO COLLECT DATA NEEDED TO DETERMINE THE FULL EXTENT OF HAZARDS REMAINING AT THE SITE AND TO EVALUATE ALTERNATIVES FOR REMEDIAL ACTIONS. THE RI WORKPLAN INCLUDED GEOPHYSICAL, SOIL GAS, SOIL, HYDROGEOLOGICAL, SURFACE WATER, SURFACE SEDIMENT AND GROUND WATER INVESTIGATIONS. HOWEVER, THE US EPA DISCONTINUED ITS WORK ON THE RI/FS IN APRIL 1985 WHEN A GROUP OF DEFENDANTS AGREED TO CONDUCT THE RI/FS IN ACCORDANCE WITH THE US EPA-APPROVED WORK PLAN.

AN AGREEMENT WAS FORMALIZED ON JUNE 19, 1985, BY A PARTIAL CONSENT DECREE IN UNITED STATES OF AMERICA V. MIDWEST SOLVENT RECOVERY, INC. ET. AL. LODGED WITH THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF INDIANA. THIS PARTIAL CONSENT DECREE REQUIRED REIMBURSEMENT OF PAST COSTS AND SPECIFIED THAT AN RI/FS BE COMPLETED IN ACCORDANCE WITH THE US EPA'S WORK PLAN FOR THE MIDCO II SITE BY THE DEFENDANTS. LITIGATION WAS STAYED UNTIL COMPLETION OF THE RI/FS.

THE CONTRACTOR FOR THE DEFENDANTS STARTED WORK IN MAY 1985. AFTER REVIEW OF THE FIRST DRAFT REMEDIAL INVESTIGATION (RI) REPORT, US EPA REQUIRED ADDITIONAL SAMPLING IN FEBRUARY 1987. THE SAMPLING WAS COMPLETED AND A FINAL RI REPORT WAS APPROVED BY US EPA IN MARCH 1988. THE CONTRACTOR SUBMITTED THE FINAL FS REPORT IN FEBRUARY 1989.

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III. COMMUNITY RELATIONS

A PUBLIC MEETING WAS HELD ON JULY 18, 1985, TO EXPLAIN THE PROPOSED REMEDIAL INVESTIGATION/FEASIBILITY STUDY. US EPA UPDATED THE COMMUNITY ON THE STATUS OF THE RI/FS USING FACT SHEETS IN NOVEMBER 1987 AND DECEMBER 1988.

A PROPOSED PLAN WAS PREPARED EXPLAINING ALTERNATIVES EVALUATED AND THE BASIS FOR PREFERENCE FOR ONE ALTERNATIVE. THE PLAN WAS MAILED TO OVER 100 PERSONS IN THE COMMUNITY. AVAILABILITY OF THE PLAN WAS PUBLISHED IN TWO LOCAL NEWSPAPERS. A PUBLIC MEETING WAS HELD ON APRIL 27, 1989 IN A HIGH SCHOOL NEAR THE SITE.

VERBAL PUBLIC COMMENTS WERE RECEIVED AT THE PUBLIC MEETING. WRITTEN COMMENTS WERE RECEIVED FROM A RESIDENT OF GARY, THE CITY OF HAMMOND, THE INDIANA DEPARTMENT OF HIGHWAYS, AND THE MIDCO STEERING COMMITTEE, WHICH REPRESENTS POTENTIALLY RESPONSIBLE PARTIES AT THE SITE. A SUMMARY OF THE MAJOR COMMENTS, AS WELL AS US EPA'S RESPONSE TO THEM, IS INCLUDED IN THE RESPONSIVENESS SUMMARY IN THE APPENDIX.

THE US EPA-SELECTED REMEDIAL ACTIONS IDENTIFIED IN THE RECORD OF DECISION DIFFER FROM THE PREFERRED ALTERNATIVE DESCRIBED IN THE PROPOSED PLAN IN THE FOLLOWING WAYS:

1. AS AN ALTERNATIVE TO DEEP WELL INJECTION, THE OPTION OF REINJECTION OF THE GROUND WATER BACK INTO THE CALUMET AQUIFER IS ALLOWED FOLLOWING TREATMENT, WITH THE CONDITION THAT THIS OPERATION NOT CAUSE SPREADING OF THE SALT PLUME.
2. A TREATABILITY VARIANCE IS APPROVED FOR THE SOLIDIFICATION STABILIZATION (S/S) OPERATION FROM THE LAND DISPOSAL RESTRICTION (LDR) TREATMENT STANDARDS. THIS IS BEING APPROVED BECAUSE EXISTING AVAILABLE DATA DO NOT DEMONSTRATE THAT S/S CAN ATTAIN LDR TREATMENT STANDARDS CONSISTENTLY FOR ALL SOIL AND DEBRIS AT THIS SITE. THE TREATABILITY VARIANCE ALLOWS ATTAINMENT OF STANDARDS THAT HAVE BEEN DEMONSTRATED TO BE ATTAINABLE FOR SOIL AND DEBRIS.

#SRRA

IV. SCOPE AND ROLE OF RESPONSE ACTION

REMOVAL OF THE SURFACE WASTES AS WELL AS EXCAVATION AND REMOVAL OF CONTAMINATED SOIL AND WASTE MATERIALS FROM THE SLUDGE PIT AND FILTER BED HAVE BEEN COMPLETED BY US EPA, (EXCEPT FOR APPROXIMATELY 100 CUBIC YARDS OF CONTAMINATED SOIL FROM THE FILTER BED WHICH WILL REMAIN ON-SITE AND BE ADDRESSED DURING THE FINAL REMEDIAL ACTION). THIS IS THE FINAL REMEDIAL ACTION AND WILL ADDRESS THE REMAINING CONTAMINATION AT THE SITE INCLUDING CONTAMINATED SUBSURFACE SOIL AND MATERIALS, CONTAMINATED GROUND WATER AND CONTAMINATED SEDIMENTS IN THE ADJACENT DITCH.

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V. SITE CHARACTERISTICS

THE RI SHOWED THAT ON-SITE SUBSURFACE SOILS ARE HIGHLY CONTAMINATED BY A LARGE NUMBER OF CHEMICALS. GROUND WATER BELOW THE SITE IS ALSO HIGHLY CONTAMINATED, BUT THE CONTAMINATED GROUND WATER DOES NOT EXTEND VERY FAR FROM THE SITE. SOME SURFACE SEDIMENTS IN THE DITCH NORTH OF THE SITE WERE ALSO HIGHLY CONTAMINATED. THE GROUND WATER WAS ALSO HIGHLY SALINE, ESPECIALLY THE LOWER PART OF THE AQUIFER. THE HIGH SALINITY IS THEORIZED TO BE LARGELY DUE TO LEACHING FROM FILL ON THE MIDCO II SITE AS WELL AS ON ADJACENT PROPERTIES. THIS FILLING OCCURRED PRIOR TO THE MIDCO OPERATIONS.

SOURCE:

ON-SITE SUBSURFACE SOILS ARE A CONTINUING SOURCE OF CONTAMINANTS TO THE GROUND WATER AND SURFACE WATER. FIFTEEN TEST TRENCHES WERE EXCAVATED INTO THE MOST CONTAMINATED PORTIONS OF THE SITE AND THIRTY SAMPLES WERE COLLECTED TO CHARACTERIZE THE EXTENT AND NATURE OF THIS SOURCE. SEVERAL INDIVIDUAL SOURCES OF CONTAMINATION APPEAR TO EXIST IN THE NORTHEASTERN, CENTRAL-NORTHEASTERN AND SOUTHEASTERN PORTIONS OF THE SITE. THE MINIMUM, MAXIMUM AND MEAN CONCENTRATIONS OF CHEMICALS DETECTED IN THESE SAMPLES ARE SUMMARIZED IN TABLE 1 IN THE APPENDIX. ELEVATED CONCENTRATIONS OF THE FOLLOWING COMPOUNDS (COMPARED TO BACKGROUND) WERE DETECTED:

ALUMINUM	METHYLENE CHLORIDE
ARSENIC	ACETONE
BARUIM	2-BUTANONE
CADMIUM	CHLOROFORM
CHROMIUM	1,1,1-TRICHLOROETHANE
COPPER	1,2-DICHLOROPROPANE
LEAD	TRICHLOROETHENE
NICKEL	1,1,2-TRICHLOROETHANE
ZINC	BENZENE
1,4 DICHLOROPHENOL	4-METHYL-2-PENTANONE
ISOPHORONE	TETRACHLOROETHENE
2,4-DIMETHYLPHENOL	TOLUENE
	ETHYLBENZENE
	TOTAL XYLENES
	PHENOL

VARIOUS POLYAROMATIC HYDROCARBONS AND PHTHALATES WERE DETECTED IN THE LOW MG/KG RANGE. PCBS WERE DETECTED IN SEVERAL SAMPLES AT LEVELS BELOW 50 MG/KG.

TOTAL VOLATILE ORGANIC COMPOUNDS WERE AS HIGH AS 0.38% BY WEIGHT AND CONSISTED PREDOMINANTLY OF ETHYLBENZENE, TOLUENE AND XYLENE. TOTAL SEMI-VOLATILE ORGANIC COMPOUNDS WERE AS HIGH AS 402 MG/KG AND CONSISTED PREDOMINATELY OF POLYAROMATIC HYDROCARBONS, PHTHALATES, ALKANES, AND IRON TRICARBONYL (N-PHENYL-2-PYRIDIMYLDMETHYLENE) BENZAMINE N,N1. ARSENIC WAS AS HIGH AS 1,430 MG/KG, CHROMIUM AS HIGH AS 1,960 MG/KG, COPPER AS HIGH AS 4,640 MG/KG, LEAD AS HIGH AS 2,810 MG/KG, ZINC AS HIGH AS 4650 MG/KG, CADMIUM AS HIGH AS 11 MG/KG AND NICKEL AS HIGH AS 1430 MG/KG. THE CONCENTRATIONS OF A NUMBER OF INORGANICS IN THE ON-SITE SOILS APPEAR TO BE CORRELATED TO THE CONCENTRATION OF ALUMINUM, INCLUDING ARSENIC, CADMIUM, LEAD, BARIUM, CHROMIUM, COPPER, NICKEL, ANTIMONY AND TIN.

SURFACE WATER SAMPLES WERE COLLECTED AT FIVE LOCATIONS IN THE DITCH DURING TWO ROUNDS OF SAMPLING. AN ADDITIONAL SAMPLE WAS COLLECTED FURTHER UPSTREAM ON A LATER DATE. THE MAXIMUM, MINIMUM AND AVERAGE CONCENTRATIONS ARE SUMMARIZED IN TABLE 1. METHYLENE CHLORIDE, 1, 2-DICHLOROETHANE, ACETONE, TRANS-1,2-DICHLORETHENE AND CYANIDE WERE DETECTED DURING BOTH ROUNDS OF SAMPLING IN LOCATIONS ADJACENT TO THE SITE. THE COMPOUNDS 1,1,1-TRICHLORETHANE, 4-METHYL-2-PENTONONE, TOLUENE, XYLENES, BENZIDENE, N-NITROSODIPHENYLAMINE AND SOME PHTHALATE COMPOUNDS WERE DETECTED IN ONE OF THE ROUNDS OF SAMPLING. SOME

METALS WERE ALSO DETECTED AT WHAT APPEAR TO BE ELEVATED CONCENTRATIONS.

SURFACE SEDIMENTS:

SURFACE SEDIMENT SAMPLES WERE COLLECTED FROM THE DITCH IN FIVE LOCATIONS DURING TWO ROUNDS OF SAMPLING AND IN THREE ADDITIONAL LOCATIONS DURING THE FIRST ROUND. A THIRD ROUND OF SAMPLING INCLUDED TWO ADDITIONAL SAMPLING LOCATIONS FARTHER UPSTREAM. THE RESULTS SHOW A LARGE INCREASE IN CONCENTRATION OF A NUMBER OF HAZARDOUS SUBSTANCES ADJACENT TO AND FOR A SHORT DISTANCE DOWNSTREAM FROM THE SITE. THE CONCENTRATIONS DROP OFF QUICKLY DOWNSTREAM FROM THE SITE. THESE HAZARDOUS SUBSTANCES INCLUDE: METHYLENE CHLORIDE; ACETONE, ETHYLBENZENE, TOLUENE, BENZENE, 2-BUTANONE, ARSENIC, N-NITROSODIPHENYL AMINE, CHLORDANE, PHTHALATE COMPOUNDS, PCBS, POLYAROMATIC HYDROCARBONS, CYANIDE, CHROMIUM, AND LEAD. THE MAXIMUM, MINIMUM AND AVERAGE CONCENTRATIONS ARE SUMMARIZED IN TABLE 1. THE RESULTS FOR TOTAL VOLATILE ORGANIC COMPOUNDS ARE SHOWN IN FIGURE 4, AND FOR TOTAL SEMI-VOLATILE ORGANIC COMPOUNDS IN FIGURE 5.

GROUND WATER:

THIRTY-THREE MONITORING WELLS WERE INSTALLED AND SAMPLED DURING TWO ROUNDS OF SAMPLING. EIGHT WELLS WERE INSTALLED AND SAMPLED IN AN ADDITIONAL ROUND OF SAMPLING. THE MAXIMUM, MINIMUM AND AVERAGE CONCENTRATIONS OF ALL THE GROUND WATER SAMPLES ARE SUMMARIZED IN TABLE 1.

AN UNANTICIPATED RESULT WAS THAT THE AQUIFER IN THE VICINITY OF MIDCO II IS HIGHLY CONTAMINATED WITH SALT CONSISTING PRIMARILY OF POTASium, SODIUM AND CHLORIDE. THE BASAL PART OF THE AQUIFER CONTAINS AS HIGH AS 60,000 MG/L OF CHLORIDE. THE EXTENT OF THIS CONTAMINATION IS INDICATED BY THE CHLORIDE ISOLINES FOR THE SHALLOW WELLS IN FIGURE 6 AND THE DEEP WELLS IN FIGURE 7. THE SHALLOW WELLS ARE RELATIVELY LOW IN SALT CONTENT COMPARED TO THE DEEPER WELLS. IF THE SOURCE WAS THE FILL, THIS SUGGESTS THAT THE SALINITY OF THE FILL IS LARGELY LEACHED OUT. IT IS PROBABLE THAT BULK CHEMICAL DISPOSAL IN THE FILTER BED ALSO CONTRIBUTES TO THE HIGH SALINITY IN GROUND WATER AT THE SITE.

SOME GROUND WATER SAMPLING RESULTS FOR HAZARDOUS SUBSTANCES ARE SUMMARIZED IN FIGURES 8, 9, AND 10. CYANIDE WAS DETECTED IN THE ON-SITE GROUND WATER IN ALL BUT THREE WELLS. THE HIGHEST CYANIDE VALUE (7,830 UG/L) WAS DETECTED DURING PHASE I AT E10, LOCATED ADJACENT TO THE FORMER FILTER BED. THE HIGHEST CYANIDE CONCENTRATION IN OFF-SITE WELLS WERE DETECTED AT CLUSTER F LOCATED VERY CLOSE TO THE FORMER FILTER BED (FIGURE 8).

VOCS WERE DETECTED IN ALL BUT TWO ON-SITE MONITORING CLUSTERS AND IN MOST OFF-SITE WELLS (FIGURE 9). IN GENERAL, DEEP WELLS HAD LOWER CONCENTRATIONS OF HALOGENATED VOLATILE HYDROCARBONS THAN SHALLOWER WELLS. KETONES WERE DETECTED IN MOST ON-SITE WELLS, AS WELL AS A NUMBER OF OFF-SITE MONITORING WELLS. ON SITE, THE HIGHEST CONCENTRATIONS OF TOLUENE, ETHYLBENZENE, AND TOTAL XYLENE WERE DETECTED AT E10, LOCATED CLOSE TO THE FORMER FILTER BED LOCATION, AND THE HIGHEST CONCENTRATION OF BENZENE ON SITE WAS DETECTED AT B10. OFF SITE, VOLATILE AROMATIC HYDROCARBONS WERE DETECTED ONLY AT F10, F30, C10, MW8, AND L30. BENZENE WAS DETECTED AT C10, MW8, AND L30.

FIGURE 10 SHOWS THE TOTAL SEMIVOLATILE CONCENTRATIONS IN THE GROUND WATER. SIMILAR TO THE TOTAL VOC RESULTS, THE HIGHEST CONCENTRATIONS OF TOTAL SEMIVOLATILES WERE DETECTED AT E10. PAHS WERE DETECTED IN SHALLOW ON-SITE WELLS AT CONCENTRATIONS OF LESS THAN 210 UG/L. THE ONLY PAH DETECTED IN DEEPER ON-SITE WELLS WAS 2-METHYLNAPHTHALENE. PAHS WERE ALSO DETECTED IN SOME OFF-SITE WELLS. THE CONCENTRATIONS OF PAHS AT THE OFF-SITE, UPGRADIENT WELL MW8 WERE HIGHER THAN DETECTED IN THE ON-SITE WELLS, INDICATING AN OFF-SITE SOURCE OF THESE COMPOUNDS. PHTHALATES WERE DETECTED ON AND OFF SITE. NO EVIDENCE OF PCB RELEASE TO THE GROUND WATER WITHIN THE SITE BOUNDARIES WAS FOUND DURING THE RI AT THE ANALYTICAL DETECTION LIMITS USED. HOWEVER, PCBS DETECTED AT C10 MAY HAVE BEEN A RESULT OF MIDCO II OPERATIONS.

BIOTA:

THE US FISH AND WILDLIFE SERVICE COLLECTED SAMPLES OF CRAYFISH, SNAPPING TURTLES, SMALL MAMMALS AND EARTHWORMS NEAR MIDCO II. THESE SAMPLES WERE ANALYZED FOR ORGANIC AND INORGANIC HAZARDOUS SUBSTANCES. THE RESULTS WERE COMPARED TO THE RESULTS IN CONTROL SAMPLES. ALTHOUGH THE US FISH AND WILDLIFE SERVICE HAS NOT YET ISSUED ITS FINAL REPORT, PRELIMINARY RESULTS INDICATE THAT THE FOLLOWING HAZARDOUS SUBSTANCES WERE FREQUENTLY DETECTED AT ELEVATED CONCENTRATIONS RELATIVE TO THE CONTROL SAMPLES: 2-BUTANONE; BENZENE; TOLUENE; ETHYLBENZENE; ALUMINUM; CHROMIUM; COPPER AND LEAD. ALL OF THESE CONSTITUENTS WERE DETECTED AT ELEVATED CONCENTRATIONS IN SOILS, GROUND WATER, SURFACE WATERS OR SEDIMENTS IN ON-SITE AND IN DIRECTLY AFFECTED AREAS.

SUMMARY OF SITE RISKS

FOR THE FUTURE DEVELOPMENT SCENARIO INCLUDING USAGE OF THE GROUND WATER, SOIL INGESTION, AND AIR EXPOSURE, AN ESTIMATE OF THE HEALTH RISKS IS AS FOLLOWS:

	LIFETIME CUMULATIVE CARCINOGENIC RISK*	CUMULATIVE CHRONIC NON-CARCINOGENIC RISK INDEX*
EXPOSURE TO GROUND WATER	2.6 X 10 ⁻²	124
EXPOSURE TO SOILS	3.3 X 10 ⁻⁴	2.99
* FROM TABLE 4-21 OF THE ADDENDUM TO PUBLIC COMMENT FEASIBILITY STUDY		

THE MAIN COMPOUNDS CAUSING THE CARCINOGENIC RISKS ARE:

GROUND WATER - TRICHLOROETHYLENE, METHYLENE CHLORIDE, ISOPHORONE,
1,1-DICHLOROETHANE, ARSENIC

SOILS - PCBS, TRICHLOROETHYLENE, TETRACHLOROETHENE, ARSENIC,
BENZO(A)-PYRENE

THE MAIN COMPOUNDS CAUSING THE CHRONIC NON-CARCINOGENIC RISKS ARE:

GROUND WATER - 4-METHYL-2-PENTANONE; METHYLENE CHLORIDE; SELENIUM;
ARSENIC; ACETONE; 2-BUTANONE; AND ETHYLBENZENE.

SOILS - ETHYLBENZENE, XYLENES, ARSENIC AND TETRACHLOROETHENE.

THE FOLLOWING HAZARDOUS SUBSTANCES WERE DETECTED AT CONCENTRATIONS EXCEEDING THE PRIMARY DRINKING WATER REGULATION, MAXIMUM CONTAMINANT LEVELS (MCLS) (40 CFR 141) IN GROUND WATER NEAR THE SITE: BENZENE; 1,1-DICHLOROETHENE; 1,2-DICHLORPROPANE; ETHYLBENZENE; 1,1,1-TRICHLOROETHANE; TRICHLOROETHENE; TRANS-1,2-DICHLOROETHENE; TOLUENE; VINYL CHLORIDE; XYLENES; CADMIUM; CHROMIUM; LEAD; ARSENIC; SILVER; SELENIUM; AND BARIUM.

A CUMULATIVE SUBCHRONIC HAZARD INDEX FOR AN ON-SITE FUTURE USE SCENARIO WAS CALCULATED TO BE 27. THIS INDEX IS CALCULATED BY ADDING THE RATIOS OF THE ESTIMATED SUBCHRONIC EXPOSURE RATE (SER) TO THE ACCEPTABLE SUBCHRONIC INTAKE (ASI) FOR EACH CHEMICAL. THE SUBCHRONIC HAZARD INDEX EXCEEDED UNITY FOR TOLUENE DUE TO INHALATION WHILE BATHING, TO SELENIUM AND CYANIDE DUE TO DRINKING WATER INGESTION, AND FOR COPPER DUE TO INGESTION OF DRINKING WATER, AND SOIL INGESTION. IF THE SUBCHRONIC HAZARD INDEX IS LESS THAN ONE OR UNITY, NO ADVERSE HEALTH EFFECTS WOULD BE EXPECTED. (REMEDIATION INVESTIGATION OF MIDWEST SOLVENT DISPOSAL COMPANY (MIDCO II) MARCH 1988 P-6-55 AND TABLE 6-17).

THE ESTIMATED LIFETIME, CARCINOGENIC RISKS TO THE NEAREST RESIDENT IS 5 X 10⁻⁶ DUE TO PLAY AND RECREATIONAL ACTIVITIES IN THE DITCH RESULTING IN EXPOSURE TO ARSENIC, TRICHLOROETHENE, METHYLENE CHLORIDE, ISOPHORONE, AND 1,1-DICHLOROETHANE THAT MIGRATED FROM THE SITE. (REMEDIATION INVESTIGATION OF MIDWEST SOLVENT DISPOSAL COMPANY) (MIDCO II) MARCH 1988 TABLE 6-19).

IF NO ACTION IS TAKEN TO CONTAIN OR RECOVER THE GROUND WATER, CONTAMINANTS WILL CONTINUE TO MIGRATE FROM THE SITE AND ARE PREDICTED TO AFFECT GROUND WATER IN THE AREA SHOWN IN FIGURE 11. TWO WATER WELLS USED FOR NON-DRINKING PURPOSES LOCATED ON THE GARY AIRPORT PROPERTY ARE IN THE PATH OF THE PLUME. NO EXISTING WELLS USED FOR DRINKING PURPOSES WOULD BE AFFECTED. THE GROUND WATER WOULD ALSO CONTINUE TO CONTAMINATE THE DITCH AND CAUSE THE ABOVE-MENTIONED, HUMAN HEALTH RISK TO OFF-SITE RESIDENTS AS WELL AS ENVIRONMENTAL EFFECTS.

IT HAS BEEN ARGUED THAT THE CALUMET AQUIFER AT MIDCO II SHOULD BE CONSIDERED A CLASS III AQUIFER BECAUSE OF THE HIGH SALINITY, AND, THEREFORE, THE AQUIFER SHOULD NOT BE PROTECTED FOR DRINKING WATER USAGE. HOWEVER, BECAUSE THE SALINITY IS NOT NATURAL AND HAS NOT AFFECTED A LARGE PORTION OF THE AQUIFER AND BECAUSE THE GROUND WATER IN AT LEAST SOME PORTIONS OF THE AQUIFER IS USABLE FOR DRINKING, US EPA HAS DETERMINED THAT THE CALUMET AQUIFER IN THE VICINITY OF MIDCO II IS A CLASS II AQUIFER AND SHOULD BE PROTECTED FOR DRINKING WATER USAGE.

IT HAS ALSO BEEN ARGUED THAT THERE SHOULD BE CONSIDERED NO RISK DUE TO FUTURE DRINKING WATER USAGE BECAUSE THE HIGH SALINITY WOULD PREVENT ITS USAGE. HOWEVER, THERE IS NO ASSURANCE THAT THE HAZARDOUS SUBSTANCES WILL ALWAYS MIGRATE WITHIN THE SALINITY PLUME. IN FACT FIGURES, 6 AND 7 SHOW THAT THE SHALLOW PORTION OF THE AQUIFER BELOW THE SITE (WHERE THE HIGHEST HAZARDOUS SUBSTANCE CONTAMINANT LEVELS EXIST) HAS A TOTAL DISSOLVED SOLIDS CONTENT OF MUCH LESS THAN 10,000 MG/L, THE LIMIT USED IN THE UNDERGROUND INJECTION CONTROL PROGRAM AS A CUT-OFF POINT FOR DRINKING WATER USAGE. IN ADDITION, A LARGE PORTION OF THE SALINITY IS DUE TO THE MIDCO II SITE AND POSSIBLY DUE TO THE MIDCO II OPERATIONS.

COMPOUNDS DETECTED IN THE DRAINAGE DITCH AND PONDED AREA NORTHEAST OF THE SITE WHICH ARE ABOVE FRESHWATER CHRONIC WATER QUALITY CRITERIA INCLUDE CADMIUM, CHROMIUM, COPPER, IRON, LEAD, MERCURY, NICKEL, SILVER, ZINC, CYANIDE AND DI-N-BUTYLPHTHALATE. THE US FISH AND WILDLIFE SERVICE NOTED THAT THERE ARE NO FISH PRESENT IN THE DITCH DOWNSTREAM FROM MIDCO II, APPARENTLY DUE TO CONTAMINATION FROM MIDCO II AND OTHER SOURCES. THE SERVICE BELIEVES THAT BIOTA THAT DO LIVE IN THE VICINITY OF MIDCO II HAVE ACCUMULATED ELEVATED CONCENTRATIONS OF VOLATILE AND INORGANIC COMPOUNDS WHICH ADVERSELY AFFECT FISH AND WILDLIFE RESOURCES.

CONTAMINANT MIGRATION FROM MIDCO II THROUGH GROUND WATER AND SURFACE WATER PATHWAYS MOVES TO LAKE MICHIGAN. SIGNIFICANT MIGRATORY BIRD AND ANADROMOUS FISH RESOURCES EXIST IN LAKE MICHIGAN, AND THESE COULD BE IMPACTED.

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VIII. DESCRIPTION OF ALTERNATIVES

A LARGE NUMBER OF ALTERNATIVES WERE SCREENED, USING ENGINEERING JUDGEMENT FOR APPLICABILITY, PAST PERFORMANCE AND IMPLEMENTABILITY TO ADDRESS THE CONTAMINATED SUBSURFACE SOIL AND FILL MATERIALS, THE CONTAMINATED GROUND WATER AND CONTAMINATED SURFACE SEDIMENTS. DETAILED EVALUATIONS WERE CONDUCTED FOR 14 ALTERNATIVES, WHICH ARE COMBINATIONS OF THE MOST PROMISING TECHNOLOGIES. THESE TECHNOLOGIES CAN BE CATEGORIZED AS FOLLOWS:

CONTAINMENT:

- * MULTILAYERED CAP
- * SLURRY WALL

GROUND WATER TREATMENT:

- * PUMPING OF CONTAMINATED GROUND WATER AND DISPOSAL IN AN UNDERGROUND INJECTION WELL WITHOUT TREATMENT
- * PUMPING OF CONTAMINATED GROUND WATER, TREATMENT AND THEN DISPOSAL IN AN UNDERGROUND INJECTION WELL
- * PUMPING OF CONTAMINATED GROUND WATER AND TREATMENT BY EVAPORATION

SOURCE TREATMENT:

- * SOIL VAPOR EXTRACTION
- * SOLIDIFICATION/STABILIZATION
- * IN-SITU VITRIFICATION
- * INCINERATION

ALTERNATIVES PROVIDING FOR DIRECT TREATMENT OR REMOVAL OF CONTAMINATED SOILS BELOW THE WATER TABLE WERE ELIMINATED FOR A NUMBER OF REASONS. FOR ONE, TREATMENT OF SOILS BELOW THE WATER TABLE WOULD NORMALLY REQUIRE DEWATERING OF THE AQUIFER BELOW THE SITE PRIOR TO EXCAVATION. DEWATERING WOULD REQUIRE INSTALLATION OF A CONTAINMENT BARRIER AND DISPOSAL OF A LARGE VOLUME OF CONTAMINATED GROUND WATER. BECAUSE OF THE TIME NEEDED FOR THE INJECTION WELL CONSTRUCTION, THE CONTAMINATED GROUND WATER FROM DEWATERING WOULD HAVE TO BE DISPOSED OF COMMERCIALY. THE NEAREST COMMERCIAL DEEP WELL IS IN OHIO, SO THIS DISPOSAL WOULD BE EXPENSIVE AND ADD TRANSPORTATION HAZARDS. IN ADDITION, GROUND WATER PUMP AND TREATMENT ALTERNATIVES MAY ADDRESS READILY LEACHABLE CONTAMINANTS BY GRADUAL REMOVAL BY NATURAL GROUND WATER FLUSHING. CONTAMINANTS THAT DO NOT LEACH

OUT WILL BE UNAVAILABLE FOR DIRECT INGESTION BECAUSE THEY ARE BELOW THE WATER TABLE. THEREFORE, THE SOURCE REMOVAL AND TREATMENT ALTERNATIVES ONLY ADDRESS CONTAMINATED SUBSURFACE SOILS AND MATERIALS ABOVE THE WATER TABLE AND HIGHLY CONTAMINATED MATERIALS BELOW THE WATER TABLE THAT CAN BE HANDLED BY LOCALIZED DEWATERING.

THE AREAL EXTENT AND DEPTH OF SOURCE TREATMENT ABOVE THE WATER TABLE WILL BE DETERMINED BY SOIL CLEANUP ACTION LEVELS (CALs). THE EXTENT AND PERIOD OF OPERATION OF GROUND WATER TREATMENT MEASURES WILL BE DETERMINED BY GROUND WATER CALs. SURFACE SEDIMENTS WILL BE SCRAPPED UP IN THE AREA SHOWN IN FIGURE 12 TO A DEPTH THAT WILL LEAVE THE REMAINING SEDIMENTS BELOW THE SOIL CALs. THE CALs ARE DEFINED IN SECTION X, AND INCLUDES ATTAINMENT OF MCLs IN THE GROUND WATER. THE EXPECTED AREAL EXTENT OF SOURCE AND SURFACE SEDIMENT REMEDIATION REQUIRED IS SHOWN IN FIGURE 12. THE EXPECTED AERIAL EXTENT OF GROUND WATER REMEDIATION IS SHOWN IN FIGURE 13. APPLICABLE, OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE VARIOUS ALTERNATIVES ARE SUMMARIZED IN TABLES 6, 7 AND 8 IN THE APPENDIX. THE FOURTEEN ALTERNATIVES ARE SUMMARIZED BELOW, INCLUDING THE STATUS OF COMPLIANCE WITH MAJOR ARARS.

ALTERNATIVE 1: NO ACTION

BY LAW, US EPA IS REQUIRED TO CONSIDER THE NO-ACTION ALTERNATIVE. NO ACTION WOULD BE TAKEN TO ADDRESS THE SOURCE, THE CONTAMINATED GROUND WATER OR SURFACE WATER. THE SOURCE WOULD CONTINUE TO CAUSE CONTAMINATION OF THE GROUND WATER AND SURFACE WATERS. THE CONTAMINATED GROUND WATER WOULD CONTINUE MIGRATING OFF-SITE AND MAY EVENTUALLY AFFECT NINETEEN GROUND WATER WELLS.

ALTERNATIVE 2: ACCESS RESTRICTIONS WITH CAP

THIS ALTERNATIVE CONSISTS OF THE CONSTRUCTION OF A RCRA COMPLIANT MULTI-LAYER CAP OVER THE ENTIRE SITE, AN AREA OF APPROXIMATELY 302,000 SQUARE FEET. THE CAP WOULD INCLUDE A LOW-PERMEABILITY BARRIER LAYER TO PREVENT VERTICAL MIGRATION OF WATER, A LATERAL DRAINAGE LAYER AND A VEGETATIVE COVER, AS SHOWN IN FIGURE 14. A CONCRETE CONDUIT WOULD BE INSTALLED IN THE DITCH TO CARRY SURFACE WATER PAST THE SITE.

THE SCRAPPED CONTAMINATED SEDIMENTS (ESTIMATED TO BE 1,200 CUBIC YARDS) AND AREAS OF ISOLATED SOIL CONTAMINATION WOULD BE EXCAVATED AND TRANSPORTED TO AN OFF-SITE LANDFILL FOR DISPOSAL.

GROUND WATER USE RESTRICTIONS WOULD BE PLACED IN THE AREA SHOWN IN FIGURE 11. THE TWO WELLS ON THE GARY AIRPORT PROPERTY WOULD BE REPLACED BY A CONNECTION TO THE MUNICIPAL WATER SYSTEM.

THIS AND ALL THE REMAINING ALTERNATIVES WOULD INCLUDE INSTALLATION OF A SIX FOOT CHAIN LINK FENCE WITH 3-STRAND BARBED WIRE AROUND THE SITE, INSTALLING WARNING SIGNS, AND IMPOSITION OF DEED RESTRICTIONS.

GROUND WATER AND SURFACE WATER MIGRATION WOULD BE MONITORED REGULARLY.

1. RELEVANT AND APPROPRIATE REQUIREMENTS:

THIS ALTERNATIVE WOULD BE CONSISTENT WITH HAZARDOUS WASTE LANDFILL CLOSURE REQUIREMENTS OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40 CFR 264.111, 264.116, 264.117, 264.310), AND GROUND WATER MONITORING REQUIREMENTS OF RCRA (40 CFR 264.97, AND 264.99). HOWEVER, IT WOULD NOT BE CONSISTENT WITH THE PRIMARY DRINKING WATER REGULATIONS (40 CFR 141) OR THE RCRA CORRECTIVE ACTION REQUIREMENTS (40 CFR 264.100) BECAUSE CONTAMINATION FROM THE SITE WOULD CONTINUE TO CAUSE EXCEEDANCE OF THE MCLs IN OFF-SITE GROUND WATER. IT ALSO WOULD NOT BE CONSISTENT WITH THE AMBIENT WATER QUALITY CRITERIA (AWQC) FOR PROTECTION OF AQUATIC LIFE BECAUSE THE CONTAMINATED GROUND WATER WOULD RECHARGE SURFACE WATERS AND CAUSE EXCEEDANCE OF THE AWQC.

2. APPLICABLE REQUIREMENTS:

THE OFF-SITE DISPOSAL OF CONTAMINATED SEDIMENTS WOULD HAVE TO BE IN COMPLIANCE WITH US EPA'S OFF-SITE POLICY AND ALL APPLICABLE RCRA, AND DEPARTMENT OF TRANSPORTATION (DOT) REGULATIONS.

ALTERNATIVE 3: CONTAINMENT

A CLAY SLURRY WALL WOULD BE INSTALLED AROUND THE AREA WHERE CLEAN-UP ACTION LEVELS (CALs) ARE EXCEEDED IN SOILS ABOVE THE WATER TABLE AND FOR GROUND WATER. THE WALL WOULD BE KEYED INTO THE MATERIAL CONFINING LAYER LOCATED 48 FEET BELOW THE SURFACE, AND WOULD BE APPROXIMATELY 36 INCHES WIDE AND 2,900 FEET LONG.

BECAUSE OF THE HIGH SALT CONTENT AND OTHER CONTAMINANTS AT THE SITE, BENCH SCALE TESTS WOULD BE PERFORMED IN ORDER TO DETERMINE THE FORMULATION FOR THE SLURRY. BENTONITE CLAY MAY BE AFFECTED BY THE HIGH SALINITY, SO

ATTUPULGITE CLAY MAY BE USED INSTEAD.

A MULTI-LAYER CAP AS DESCRIBED IN ALTERNATIVE 2 WOULD BE PLACED OVER THE AREA INSIDE THE SLURRY WALL. A CONDUIT WOULD BE INSTALLED AS IN ALTERNATIVE 2. CONTAMINATED SEDIMENTS WOULD BE SCRAPED AND CONTAINED WITHIN THE CAP AND SLURRY WALL. AREAS OF DISCONTINUOUS SOIL CONTAMINATION WOULD BE EXCAVATED AND CONTAINED WITHIN THE CAP AND SLURRY WALL. AN EXTRACTION WELL WOULD BE PLACED IN THE CONTAINMENT AREA TO LOWER THE GROUND WATER INSIDE THE WALL BY APPROXIMATELY 0.5 FEET TO INSURE AN INWARD GROUND WATER GRADIENT. INITIALLY, THIS WOULD REQUIRE DISPOSAL OF APPROXIMATELY 500,000 GALLONS OF CONTAMINATED GROUND WATER. THIS WOULD BE DISPOSED OF IN THE NEAREST COMMERCIAL DEEP WELL.

AS WITH ALTERNATIVE 2, THE SITE WOULD BE FENCED AND POSTED, DEED RESTRICTIONS IMPOSED, AND A MONITORING PROGRAM IMPLEMENTED.

1. RELEVANT AND APPROPRIATE REQUIREMENTS:

THIS ALTERNATIVE WOULD BE CONSISTENT WITH RCRA HAZARDOUS WASTE LANDFILL CLOSURE REQUIREMENTS. BECAUSE THE GROUND WATER OUTSIDE THE SLURRY WALL WOULD MEET THE CALS, THIS ALTERNATIVE WOULD ALSO BE CONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS, AND THE PRIMARY DRINKING WATER REGULATIONS. AFTER CONTAINMENT OF THE MIDCO II SOURCE, SURFACE WATER WOULD SHORTLY MEET THE AWQC (UNLESS OTHER SOURCES ARE PRESENT).

2. RESIDUAL RISKS:

BECAUSE NO TREATMENT IS INVOLVED IN THIS ALTERNATIVE, THE RESIDUALS CONTAINED WITHIN THE SLURRY WALL AND CAP WOULD BE THE SAME AS PRESENTLY AT THE SITE. THE RISKS INVOLVED IN CASE THE CAP AND SLURRY WALL ARE DAMAGED OR IF RESIDENTIAL DEVELOPMENT OCCURRED ON THE SITE, WOULD BE THE SAME AS THE PRESENT SITE RISKS.

ALTERNATIVE 4A: GROUND WATER PUMPING AND DEEP WELL INJECTION

THIS AND ALL OTHER ALTERNATIVES TREATING THE GROUND WATER INCLUDES INSTALLATION AND OPERATION OF GROUND WATER, EXTRACTION WELLS TO INTERCEPT THE CONTAMINATED GROUND WATER THAT EXCEEDS THE CALS. THE RESULTS OF A PRELIMINARY MODEL, ESTIMATE THAT FOUR EXTRACTION WELLS SHOULD BE INSTALLED TO RECOVER GROUND WATER AS SHOWN IN FIGURE 15. THE TOTAL ESTIMATED PUMPING RATE FOR THE FOUR WELLS IS 28 GPM. THE EXTRACTION WELLS WOULD BE OPERATED UNTIL GROUND WATER CALS ARE MET IN ALL PORTIONS OF THE CALUMET AQUIFER AFFECTED BY THE SITE. BECAUSE THE CONTAMINATED GROUND WATER WOULD BE CONTAINED, AWQC WOULD SHORTLY BE ATTAINED IN SURFACE WATER, UNLESS PREVENTED BY OTHER SOURCES.

A CLASS I HAZARDOUS WASTE UNDERGROUND INJECTION WELL WOULD BE INSTALLED. THE INJECTION ZONE WOULD BE LOCATED APPROXIMATELY 2,250 FEET BELOW THE SURFACE IN THE MOUNT SIMON AQUIFER. THE UNDERGROUND INJECTION OPERATION MAY BE COMBINED WITH THE MIDCO I REMEDIAL ACTION IF THIS DETERMINED TO BE COST EFFECTIVE. THE 9TH AVENUE DUMP REMEDIAL ACTION MAY ALSO INCLUDE UTILIZING THE DEEP WELL FROM MIDCO FOR DISPOSAL OF SALINE WASTE WATER. IN THESE CASES, THE COMBINED TREATMENT AND DISPOSAL ACTIVITIES WILL CONSTITUTE AN ON-SITE ACTION FOR PURPOSES OF THE OFF-SITE POLICY, WITH THE EXCEPTION THAT THE TRANSPORTED WASTES MUST BE MANIFESTED.

THE COMBINED TREATMENT AND DISPOSAL CAN BE CONSIDERED AN ON-SITE ACTION PURSUANT TO SECTION 104(D)(4) OF CERCLA BECAUSE THE FOLLOWING CRITERIA ARE MET (INTERIM RCRA/CERCLA GUIDANCE ON NON-CONTIGUOUS SITES AND ON-SITE MANAGEMENT OF WASTE AND TREATMENT RESIDUE, PORTER, MARCH 27, 1986 OSWER DIRECTIVE 8347-01):

1. THE SITES ARE CLOSE TOGETHER:
2. THE WASTES ARE COMPATIBLE:
3. THE WASTES WILL BE MANAGED AS PART OF A HIGHLY RELIABLE LONG-TERM REMEDY;
4. THE INCREMENTAL SHORT-TERM IMPACTS TO PUBLIC HEALTH AND THE ENVIRONMENT WILL BE MINIMAL.

1. APPLICABLE REQUIREMENTS:

THE DEEP WELL INJECTION MUST BE IN COMPLIANCE WITH THE LAND DISPOSAL RESTRICTION (LDR) REQUIREMENTS OF 40 CFR 268 AND 40 CFR 148. THE FOLLOWING LISTED HAZARDOUS WASTES HAVE BEEN DISPOSED OF ON THE SITE AND ARE CONTAINED IN THE CONTAMINATED SUBSURFACE SOILS, GROUND WATER AND SURFACE SEDIMENTS: F001, F002, F003, F005, F007, F008, F009.

FOR THIS REASON, BEFORE THE GROUND WATER CAN BE INJECTED WITHOUT TREATMENT, A PETITION TO ALLOW LAND DISPOSAL OF WASTE PROHIBITED UNDER SUBTITLE C OF 40 CFR 268, MUST BE GRANTED BY THE US EPA ADMINISTRATOR PURSUANT TO 40 CFR 268.6 AND 40 CFR 148 SUBPART C. THIS PETITION MUST DEMONSTRATE THAT THERE WILL BE NO MIGRATION OF HAZARDOUS CONSTITUENTS FROM THE INJECTION ZONE FOR AS LONG AS THE WASTES REMAIN HAZARDOUS.

A CROSS SECTION OF THE GEOLOGY OF THIS AREA IS SHOWN IN FIGURE 16. THE INJECTION ZONE IN THE MOUNT SIMON AQUIFER IS SEPARATED BY GEOLOGICAL FORMATIONS FROM DRINKING WATER AQUIFERS. NEARBY CLASS I UNDERGROUND INJECTION WELLS THAT ARE PRESENTLY OPERATING, HAVE SUBMITTED PETITIONS PURSUANT TO 40 CFR 268.6. THESE PETITIONS ARE PRESENTLY UNDER REVIEW BY US EPA.

THE INJECTION WELL MUST BE CONSTRUCTED, INSTALLED, TESTED, MONITORED AND OPERATED, CLOSED AND ABANDONED IN ACCORDANCE WITH US EPA REQUIREMENTS AND CONDITIONS PURSUANT TO 40 CFR 144 AND 146. IN ADDITION, REPORTING REQUIREMENTS MUST BE IN ACCORDANCE WITH 40 CFR 144 AND 146. CONTAMINATED SEDIMENTS WILL BE SCRAPED AND DISPOSED OFF-SITE IN ACCORDANCE WITH THE US EPA OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REQUIREMENTS.

THE REMEDIAL ACTION MAY ALSO REQUIRE RESPONSES TO OPERATIONAL PROBLEMS, AND IMPLEMENTING CORRECTIVE ACTIONS PURSUANT TO 40 CFR 146.64, 144.67, 144.12, 144.51(D) AND 144.55. THIS MAY INCLUDE REQUIREMENTS FOR CONSTRUCTION, MONITORING, REPORTING, WELL PLUGGING AND INJECTION WELL CLOSURE AS NECESSARY TO PREVENT MOVEMENT OF ANY CONTAMINANT INTO AN UNDERGROUND SOURCE OF DRINKING WATER (USDW)(40 CFR 144.3), DUE TO OPERATION OF THE INJECTION WELL. THIS MAY ALSO REQUIRE IMPLEMENTATION OF REMEDIAL ACTIONS TO RESTORE ANY USDW THAT BECOMES CONTAMINATED AS A RESULT OF OPERATION OF THE INJECTION WELL, TO BACKGROUND WATER QUALITY TO THE EXTENT PRACTICAL, PURSUANT TO SECTION 3004(U) AND 3008(H) OF THE 1984 HAZARDOUS AND SOLID WASTE AMENDMENTS.

2. RESIDUAL RISKS AND RELEVANT AND APPROPRIATE REQUIREMENTS:

NATURAL ATTENUATION AND FLUSHING OF THE SOURCE WOULD OCCUR DURING OPERATION OF THE GROUND WATER EXTRACTION SYSTEM. HOWEVER, SOME HAZARDOUS SUBSTANCE RESIDUALS WOULD REMAIN IN THE SUBSURFACE SOILS. THE RESIDUAL RISKS CANNOT BE DETERMINED AT THIS TIME. THEREFORE, A SITE COVER WOULD BE PLACED OVER THE CONTAMINATED SOILS THAT WOULD BE CONSISTENT WITH RCRA HAZARDOUS WASTE LANDFILL CLOSURE REQUIREMENTS (40 CFR 264.111, 264.116, 264.117, 264.310). THE SITE WOULD BE FENCED, DEED RESTRICTIONS IMPOSED, AND A GROUND WATER MONITORING SYSTEM IMPLEMENTED CONSISTENT WITH RCRA REQUIREMENTS.

ALTERNATIVE 4C: GROUND WATER PUMPING, TREATMENT AND EITHER DEEP WELL INJECTION OR REINJECTION INTO THE CALUMET AQUIFER

THIS ALTERNATIVE IS THE SAME AS ALTERNATIVE 4A EXCEPT THAT THE CONTAMINATED GROUND WATER WOULD BE TREATED TO THE EXTENT NECESSARY TO MEET US EPA REQUIREMENTS PRIOR TO THE UNDERGROUND INJECTION. FOR THIS ALTERNATIVE, US EPA APPROVAL OF THE UNDERGROUND INJECTION WELL WOULD BE REQUIRED, BUT NO PETITION DEMONSTRATION WOULD BE NEEDED.

PRIOR TO THE DEEP WELL INJECTION, LAND DISPOSAL RESTRICTIONS (LDR) TREATMENT STANDARDS WOULD BE MET. TREATMENT REQUIREMENTS FOR LISTED WASTES F001, F002, F003, AND F005 (40 CFR 268), WOULD LIKELY REQUIRE AN AIR STRIPPER AND A LIQUID-PHASE GRANULAR ACTIVATED CARBON POLISH SYSTEM. TREATMENT MAY ALSO BE REQUIRED FOR CYANIDE, CHROMIUM, LEAD AND NICKEL TO MEET THE PROPOSED TREATMENT STANDARDS FOR LISTED WASTES F007, F008 AND F009 (FR, VOL 54, NO 7). THE LDR TREATMENT STANDARDS ARE LISTED IN TABLES 19 AND 20 (THE STANDARDS FOR NON-WASTEWATERS WOULD BE APPLICABLE TO CONTAMINATED GROUND WATER).

IT IS ANTICIPATED THAT TREATMENT UNITS WOULD BE DESIGNED FOR AN AVERAGE FLOW OF 28 GPM. AIR EMISSIONS FROM THE AIR STRIPPER WOULD BE CONTROLLED MOST LIKELY WITH A CARBON CANISTER. THE DEGREE OF AIR EMISSIONS CONTROL REQUIRED IS DEFINED IN SECTION X. TREATMENT RESIDUALS, WHICH MAY INCLUDE SPENT CARBON AND METALS SLUDGE WOULD BE DISPOSED OF OFF-SITE IN ACCORDANCE WITH US EPA'S OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REGULATIONS.

AS WITH ALTERNATIVE 4A, THE TREATMENT AND UNDERGROUND INJECTION WELL SYSTEM MAY BE COMBINED WITH MIDCO I.

ALTERNATIVELY, THE GROUND WATER COULD BE TREATED AND THEN REINJECTED INTO THE CALUMET AQUIFER IF REINJECTION IS CONDUCTED IN A MANNER THAT WILL PREVENT SPREADING OF THE SALT PLUME. AT THE END OF THE PUMPING, TREATMENT AND REINJECTION OPERATION, THE GROUND WATER AT THE SITE MUST MEET THE GROUND WATER CALS (SECTION X). THE GOAL OF THE REMEDIAL ACTIONS IS TO RESTORE THE GROUND WATER QUALITY. NORMALLY, THIS WOULD REQUIRE THAT THE REMEDIAL ACTION ALSO REDUCE SECONDARY (NON-HAZARDOUS) CONTAMINANTS SUCH AS TOTAL DISSOLVED SOLIDS (TDS) EITHER TO BACKGROUND LEVELS OR TO SECONDARY MAXIMUM CONTAMINANT LEVELS (40 CFR 143). HOWEVER, AT MIDCO II,

SINCE THERE ARE NEARBY CONTAMINANT SOURCES, HIGH LEVELS OF TDS WOULD BE LEFT IN THE GROUND WATER AT THE SITE AT THE COMPLETION OF REMEDIAL ACTIONS.

ALTERNATIVE 4E: GROUND WATER PUMPING AND EVAPORATION

A GROUND WATER EXTRACTION SYSTEM WOULD BE INSTALLED AND OPERATED IN THE SAME MANNER AS IN ALTERNATIVES 4A AND 4C. HOWEVER, THE CONTAMINATED GROUND WATER WOULD BE TREATED BY EVAPORATION, INSTEAD OF BY SEPARATE TREATMENT OPERATIONS COMBINED WITH DEEP WELL INJECTION. ALL CONTAMINANTS WOULD BE CONCENTRATED INTO TREATMENT RESIDUALS THAT WOULD HAVE TO BE DISPOSED OF OFF-SITE IN ACCORDANCE WITH US EPA'S OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REQUIREMENTS. THE RESIDUALS WILL INCLUDE BLOW DOWN AND SALT CAKE. IN ADDITION, AIR STRIPPING AND CARBON ADSORPTION MAY BE REQUIRED PRIOR TO DISCHARGE OF THE CONDENSATE. AIR EMISSIONS WILL HAVE TO BE CONTROLLED TO MEET THE CRITERIA DESCRIBED IN SECTION X.

THE BLOW DOWN AND CARBON RESIDUALS WOULD LIKELY BE COMMERCIALY INCINERATED. CYANIDE AND METALS IN THE GROUND WATER WOULD LIKELY BE CONCENTRATED IN THE SALT CAKE. IF THIS OCCURS, LAND DISPOSAL OF THE SALT CAKE WOULD LIKELY NOT BE ALLOWED UNDER THE LAND DISPOSAL RESTRICTIONS REGULATIONS WITHOUT PRIOR DESTRUCTION OF THE CYANIDE AND TREATMENT OF METALS (FR, VOL 53, NO 7). SEE TABLE 20.

THE FINAL SITE COVER AND HANDLING OF CONTAMINATED SEDIMENTS WOULD BE THE SAME AS IN ALTERNATIVES 4A AND 4C.

THE EVAPORATION SYSTEM MAY BE COMBINED WITH MIDCO I.

ALTERNATIVE 5A: EXCAVATION ABOVE THE GROUND WATER ELEVATION AND LANDFILLING

THIS ALTERNATIVE AND ALTERNATIVES 5C, 5E AND 5G TREAT THE SOURCE AND SURFACE SEDIMENTS, BUT NOT THE GROUND WATER.

1. EXCAVATION AND OFF-SITE DISPOSAL:

AS PART OF THE FEASIBILITY STUDY A RISK ASSESSMENT WAS CONDUCTED TO ESTIMATE THE RISKS TO OFF-SITE RESIDENTS AND AIRPORT WORKERS DURING EXCAVATION ACTIVITIES DUE TO VOLATILIZATION OF ORGANIC COMPOUNDS AND FUGITIVE DUST EMISSIONS. USING VERY CONSERVATIVE ASSUMPTIONS, IT WAS ESTIMATED THAT THE CARCINOGENIC RISK TO THE NEAREST RESIDENTS MAY BE 5.05×10^{-8} AND THE RISK TO AIRPORT WORKERS MAY BE 1.1×10^{-6} . BECAUSE THESE RISKS ARE LOW, IT IS ACCEPTABLE TO CONDUCT THE EXCAVATION ACTIVITY WITHOUT PRIOR SOIL VAPOR EXTRACTION (SVE) AS LONG AS ADEQUATE PROTECTION IS PROVIDED TO ON-SITE WORKERS, EMISSIONS ARE MONITORED, MEASURES ARE TAKEN TO MINIMIZE EMISSIONS DURING EXCAVATION, AND PROVISIONS ARE MADE TO SHUT DOWN THE OPERATION IN CASE ATMOSPHERIC CONDITIONS MAY CAUSE LEVELS OF EXPOSURE EXCEEDING THE CRITERIA DEFINED FOR AIR EMISSIONS IN SECTION X.

AN ESTIMATED 34,600 CUBIC YARDS OF CONTAMINATED SOIL ABOVE THE WATER TABLE AND 500 CUBIC YARDS OF CONTAMINATED SURFACE SEDIMENTS WOULD BE EXCAVATED AND DISPOSED OF OFF-SITE. ALL OFF-SITE DISPOSAL WOULD BE REQUIRED TO COMPLY WITH US EPA'S OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REGULATIONS. LDERS UNDER 40 CFR 268 MAY NOT ALLOW THIS ALTERNATIVE BECAUSE CYANIDE, METALS AND VOLATILE ORGANIC COMPOUNDS WOULD NOT BE TREATED (SEE STANDARDS FOR NON-WASTEWATERS IN TABLES 19 AND 20).

2. SITE COVER AND GROUND WATER:

THE SITE WOULD BE RESTORED TO GRADE WITH UNCONTAMINATED FILL. A CONDUIT WOULD BE INSTALLED IN THE DITCH ALONG THE SITE. OVER A LONG PERIOD OF TIME, GROUND WATER MAY ATTENUATE TO BELOW CALS. HOWEVER, IN THE MEANTIME, THE GROUND WATER AT THE SITE WOULD BE HIGHLY CONTAMINATED AND WOULD CONTINUE TO MIGRATE OFF-SITE. IT MAY EVENTUALLY AFFECT GROUND WATER IN THE AREA SHOWN IN FIGURE 11. GROUND WATER USAGE RESTRICTIONS WOULD BE IMPOSED IN THIS AREA, AND THE TWO WELLS ON GARY AIRPORT PROPERTY WOULD BE REPLACED BY CONNECTIONS TO THE MUNICIPAL WATER SYSTEM. THIS ACTION WOULD BE CONSISTENT WITH RCRA GROUND WATER MONITORING REQUIREMENTS. IT WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER STANDARDS BECAUSE MCLS WOULD BE EXCEEDED IN OFF-SITE GROUND WATER. THE AWQC MAY BE EXCEEDED IN SURFACE WATERS DUE TO OFF-SITE MIGRATION OF THE GROUND WATER.

THE SITE WOULD BE FENCED, DEED RESTRICTIONS IMPOSED AND GROUND WATER MONITORING IMPLEMENTED AS IN ALTERNATIVE 2.

ALTERNATIVE 5C: EXCAVATION ABOVE WATER TABLE, INCINERATION AND ASH SOLIDIFICATION

INCINERATION:

AS WITH ALTERNATIVE 5A, MEASURES WOULD BE TAKEN TO INSURE THAT AIR EMISSIONS DURING EXCAVATION AND HANDLING OF THE SUBSURFACE MATERIAL DO NOT EXCEED THE CRITERIA FOR AIR EMISSIONS DEFINED IN SECTION X.

FOLLOWING EXCAVATION, THE CONTAMINATED SUBSURFACE AND SEDIMENT MATERIAL WOULD BE INCINERATED. RCRA REGULATIONS BECOME APPLICABLE TO THE MATERIAL EXCAVATED AND TREATED. IT IS ANTICIPATED THAT THE INCINERATOR WOULD BE A TRANSPORTABLE, ROTARY-CELL TYPE, APPROXIMATELY THIRTY-EIGHT FEET LONG WITH A TEN-FOOT INNER DIAMETER.

THE INCINERATOR IS EXPECTED TO HAVE A CAPACITY OF APPROXIMATELY 17.5 TONS PER HOUR. A SECONDARY COMBUSTION CHAMBER WOULD BE USED TO ASSURE COMPLETE DESTRUCTION OF THE WASTES, AND A CAUSTIC SCRUBBER WOULD NEUTRALIZE ACIDIC FLUE GASES AND CONTROL PARTICULATE EMISSIONS. THE INCINERATOR WOULD HAVE TO MEET THE TESTING AND PERFORMANCE STANDARDS IN 40 CFR 264.341, 264.351, 264.343, 264.342, 7611.70 AND SPECIAL STATE OF INDIANA REQUIREMENTS INCLUDING A TEST BURN AND EXTENSIVE STACK SAMPLING.

THE INCINERATION SHOULD DESTROY NEARLY ALL THE ORGANIC COMPOUNDS AND CYANIDE. THE INORGANICS (OTHER THAN CYANIDE) WOULD LARGELY REMAIN IN THE ASH. THE REMAINING LIFETIME CARCINOGENIC RISK IN THE ASH DUE TO DIRECT SOIL INGESTION WOULD BE APPROXIMATELY 2.77×10^{-4} DUE TO ARSENIC. HOWEVER, THESE LEVELS OF ARSENIC REPRESENT BACKGROUND CONCENTRATIONS. THE REMAINING CUMULATIVE CHRONIC NON-CARCINOGENIC RISK INDEX DUE TO SOIL INGESTION WOULD BE 2.8 DUE PRIMARILY TO ARSENIC, ANTIMONY, BERYLLIUM AND CHROMIUM (VI) IN THE SOIL. THE SUBCHRONIC RISK INDEX WOULD REMAIN ABOVE 1.0 FOR TOLUENE, COPPER, SELENIUM AND CYANIDE BECAUSE GROUND WATER WOULD NOT BE REMEDIATED. THE METALS IN THE ASH MAY BE IN A FORM THAT WOULD LEACH TO A SIGNIFICANT DEGREE. HOWEVER, PAST LEACHING FROM THE SOIL HAS CAUSED GROUND WATER CONTAMINATION BY A NUMBER OF METALS.

THE INCINERATION AT MIDCO II MAY BE COMBINED WITH THE INCINERATION AT THE NEARBY NINTH AVENUE DUMP SITE. FOR PURPOSES OF RCRA AND THE US EPA OFF-SITE POLICY, THE COMBINED ACTION WOULD BE CONSIDERED ONE SITE.

THE INCINERATION PROCESS MUST SATISFY THE LDRS FOR NON-WASTEWATERS FOR LISTED WASTES NO. F001, F002, F003, F005, F007, F008, F009 (SEE TABLES 19 AND 20). HOWEVER, A CAPACITY VARIANCE IS IN EFFECT FOR WASTE CATEGORIES F001, F002, F003 AND F005 IN SOIL, WASTE AND DEBRIS UNTIL NOVEMBER 1990.

SOLIDIFICATION:

IN ADDITION TO THE RISKS REMAINING FROM THE ASH, THE CONCENTRATIONS OF SOME INORGANIC COMPOUNDS (ARSENIC, CHROMIUM AND LEAD) IN THE ASH WILL BE SIMILAR TO CONCENTRATIONS IN SOME LISTED HAZARDOUS WASTES FOR WHICH TREATMENT IS REQUIRED PRIOR TO LAND DISPOSAL. THIS IS SHOWN IN TABLE 9 IN THE APPENDIX. FOR THESE REASONS, SOLIDIFICATION/STABILIZATION (S/S) OF THE ASH WILL BE REQUIRED FOLLOWING THE INCINERATION. FOLLOWING S/S, THE SOLIDIFIED MASS MUST MEET THE LDR TREATMENT STANDARDS (SEE TABLE 19 AND 29), OR MEET STANDARDS FOR A TREATABILITY VARIANCE, IF THIS IS APPROVED PURSUANT TO 40 CFR 268.44. IN ADDITION, IF THE ASH IS A HAZARDOUS WASTES BY CHARACTERISTIC, D004, D005, D006, D007, D008, D009 OR D010, LDRS FOR THESE WASTES MAY BE APPLICABLE AT THE TIME OF THE ACTION.

SITE COVER AND GROUND WATER:

THE INCINERATED/SOLIDIFIED MATERIAL WOULD BE PLACED ON-SITE. THE DESIGN OF THE FINAL COVER WOULD DEPEND ON THE RESULTS OF THE LEACHATE TESTS ON THE ASH OR SOLIDIFIED MATERIAL. IF THE WASTE IS DELISTABLE, A TWO-FOOT SOIL COVER WOULD BE PLACED OVER THE SITE. IF NOT, A FINAL COVER IN COMPLIANCE WITH APPLICABLE RCRA LANDFILL CLOSURE REQUIREMENTS WOULD BE INSTALLED.

AS IN ALTERNATIVE 5A, GROUND WATER MONITORING, USAGE RESTRICTIONS, MUNICIPAL WATER CONNECTIONS, DEED RESTRICTIONS, AND ACCESS RESTRICTIONS WOULD BE IMPLEMENTED. THIS ALTERNATIVE WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER REGULATIONS.

ALTERNATIVE 5E: SOLIDIFICATION

TWO METHODS OF MIXING FOR SOLIDIFICATION ARE AVAILABLE. ONE INVOLVES EXCAVATION, MIXING ABOVE GROUND AND REPLACEMENT OF THE SOLIDIFIED MATERIAL ON-SITE; THE SECOND INVOLVES IN-SITU ADDITION OF REAGENTS AND MIXING.

USING EITHER METHOD OF MIXING, MEASURES WOULD BE TAKEN TO INSURE THAT AIR EMISSIONS DURING EXCAVATION AND SOLIDIFICATION DO NOT EXCEED THE CRITERIA FOR THE AIR EMISSIONS DEFINED IN SECTION X.

1. ABOVE GROUND MIXING:

SUBSURFACE MATERIALS ABOVE THE GROUND WATER TABLE AND SURFACE SEDIMENTS THAT EXCEED SOIL CALS WOULD BE EXCAVATED, MIXED WITH WATER, BINDER AND REAGENTS IN A TANK AND THEN PLACED BACK ON SITE TO CURE. IT IS ANTICIPATED THAT THE CONTAMINATED MATERIALS WOULD BE FED TO THE MIXER AT A MAXIMUM RATE OF 75 CUBIC YARDS PER HOUR. LARGE ITEMS SUCH AS STUMPS WOULD BE SIFTED OUT AND SANDWICHED INSIDE LAYERS OF SOLIDIFIED MATERIAL ON THE SITE.

ONCE THE CONTAMINATED SUBSURFACE MATERIALS AND SEDIMENTS ARE EXCAVATED AND TREATED, THE RCRA REGULATIONS BECOME APPLICABLE. PURSUANT TO 40 CFR 268, LAND DISPOSAL OF THE TREATED MATERIAL WOULD NOT BE ALLOWED UNLESS THE LDR TREATMENT STANDARDS ARE ATTAINED (SEE TABLES 19 AND 20), OR TREATABILITY VARIANCE TREATMENT STANDARDS ARE ATTAINED (SEE TABLE 21) (40 CFR 268.44). UNTIL NOVEMBER 1990, THERE ARE NO LDR TREATMENT STANDARDS IN EFFECT FOR WASTE CATEGORIES F001, F002, F003 AND F005 IN SOIL, WASTE AND DEBRIS BECAUSE OF A CAPACITY VARIANCE. THE PROPOSED LDR TREATMENT STANDARD FOR CYANIDE REQUIRES DESTRUCTION OF CYANIDE RATHER THAN REDUCTION IN MOBILITY.

BECAUSE IT MAY BE IMPOSSIBLE TO MEET THE LDR TREATMENT STANDARDS FOR CYANIDE BY S/S, AND BECAUSE EXISTING AVAILABLE DATA DO NOT DEMONSTRATE THAT FULL SCALE OPERATION OF S/S CAN ATTAIN THE LDR TREATMENT STANDARDS CONSISTENTLY FOR ALL SOIL AND DEBRIS AT THIS SITE, THIS ALTERNATIVE WILL COMPLY WITH THE LDRS THROUGH A TREATABILITY VARIANCE. THE REQUIRED TREATMENT STANDARDS (BASED ON RESULTS OF TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP) TESTS) ARE SUMMARIZED IN TABLE 21. CONSTITUENTS THAT ARE NOT LISTED IN TABLE 21 SHOULD BE REDUCED IN MOBILITY BY 90% BASED ON TCLP TESTS.

REGULATIONS APPLICABLE TO HAZARDOUS WASTES BY CHARACTERISTIC (D003, D004, D005, D006, D007, D008, D009, D010) MAY BECOME APPLICABLE TO THE OPERATION BY THE TIME S/S IS IMPLEMENTED. IF ONLY VOCs EXCEED THE LAND DISPOSAL RESTRICTION STANDARDS, THEN A SOIL VAPOR EXTRACTION OPERATION WOULD BE CONDUCTED TO ASSURE ATTAINMENT OF THESE STANDARDS.

2. IN-SITU MIXING:

AS AN ALTERNATIVE TO EXCAVATION AND SOLIDIFICATION, THE SUBSURFACE SOIL TO BE REMEDIATED WOULD BE SOLIDIFIED IN-SITU. IT IS ANTICIPATED THAT THE SYSTEM WOULD UTILIZE A CRANE-MOUNTED MIXING SYSTEM. THE MIXING HEAD WOULD BE ENCLOSED IN A BOTTOM-OPENED CYLINDER TO ALLOW CLOSED SYSTEM MIXING OF THE TREATMENT CHEMICALS WITH THE SOIL. THE BOTTOM-OPENED CYLINDER WOULD BE LOWERED ONTO THE SOIL AND THE MIXING BLADES WOULD BE STARTED, MOVING THROUGH THE DEPTH IN AN UP AND DOWN MOTION, WHILE CHEMICALS ARE INTRODUCED. VAPORS AND DUST WOULD BE PULLED INTO THE VAPOR TREATMENT SYSTEM, COMPOSED OF A DUST COLLECTION SYSTEM FOLLOWED BY IN-LINE ACTIVATED CARBON TREATMENT. AN INDUCED DRAFT FAN WOULD EXHAUST THE TREATED AIR TO THE ATMOSPHERE. AT THE COMPLETION OF A MIXING, THE BLADES WOULD BE WITHDRAWN AND THE CYLINDER REMOVED. THE CYLINDER WOULD THEN BE PLACED ADJACENT TO AND OVERLAPPING THE PREVIOUS CYLINDER. THIS WOULD BE REPEATED UNTIL THE ENTIRE AREA HAS BEEN TREATED. THE SURFACE SEDIMENTS WOULD BE SCRAPED UP AND CONSOLIDATED ON-SITE FOR SOLIDIFICATION.

USING IN-SITU MIXING, THE LDRS WOULD NOT BE APPLICABLE NOR CONSIDERED TO BE RELEVANT AND APPROPRIATE. THE S/S WILL BE CONSIDERED SUCCESSFUL IF IT REDUCES THE MOBILITY OF CONTAMINANTS SO THAT LEACHATE FROM THE SOLID MASS WILL NOT CAUSE EXCEEDANCE OF THE CLEANUP ACTION LEVELS IN THE GROUND WATER (SEE SECTION X). IF LEACHING OF VOCs MAY CAUSE EXCEEDANCE OF GROUND WATER CALS, BUT LEACHING OF OTHER CONSTITUENTS WILL NOT CAUSE EXCEEDANCE OF GROUND WATER CALS (BASED ON THE TREATABILITY TESTS); THEN A SOIL VAPOR EXTRACTION OPERATION (AS IN ALTERNATIVE 5A) WILL BE CONDUCTED TO ASSURE THAT LEACHING OF VOCs DOES NOT CAUSE EXCEEDANCE OF THESE CALS.

3. RESIDUAL RISKS:

IF THE SOLIDIFICATION/STABILIZATION OPERATION IS SUCCESSFUL, THE EXPOSURES DUE TO DIRECT SOIL INGESTION AND LEACHING TO GROUND WATER SHOULD BE NEARLY ELIMINATED.

USING SOLIDIFICATION, THE MOBILITY OF HAZARDOUS CONSTITUENTS WOULD BE REDUCED THROUGH BINDING OR ENTRAPMENT OF HAZARDOUS CONSTITUENTS IN A SOLID MASS WITH LOW PERMEABILITY THAT RESISTS LEACHING. SOME VOLATILE ORGANIC COMPOUNDS WILL BE DRIVEN OFF DURING THE PROCESS, BUT THESE CAN BE CONTROLLED SO THAT THE EFFECTS ON OFF-SITE AND ON-SITE PERSONS WOULD BE NEGLIGIBLE. S/S HAS BEEN SELECTED AS THE BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) OR PART OF A BDAT FOR TREATMENT OF A NUMBER OF RCRA HAZARDOUS WASTES FOR THE LAND DISPOSAL RESTRICTIONS (40 CFR 268). THESE INCLUDE THE FOLLOWING LISTED HAZARDOUS WASTES: F006, K001, K015, K022, K048, K049, K050, K051, K052, K061, K086, K087, K101. THESE LISTED HAZARDOUS WASTES CONTAIN THE FOLLOWING HAZARDOUS CONSTITUENTS: CADMIUM, CHROMIUM, LEAD, NICKEL, SILVER, ARSENIC, AND SELENIUM (40 CFR 268, PROMULGATED AUGUST 17, 1988). S/S IS CONSIDERED A POTENTIALLY APPLICABLE TECHNOLOGY FOR TREATMENT OF HAZARDOUS WASTES BY CHARACTERISTIC NUMBERS D004, D005, D006, D007, D008, AND D010, WHICH CONTAIN ARSENIC, BARIUM, CADMIUM, CHROMIUM, LEAD, AND SELENIUM (FR, VOL 54, NO 7, P 1098-1099).

THE S/S PROCESS HAS WEAKNESSES. SOME CONSTITUENTS INTERFERE WITH THE BONDING WITH WASTE MATERIALS. THIS INCLUDES HIGH ORGANIC CONTENT (GREATER THAN 45% BY WEIGHT), SEMIVOLATILE ORGANIC COMPOUNDS GREATER THAN 1.0%, CYANIDE GREATER THAN 3,000 PPM, AND HIGH OIL AND GREASE (GREATER THAN 10%). IN ADDITION, HALIDE MAY RETARD SETTING, AND SOLUBLE MANGANESE, TIN, ZINC, COPPER AND LEAD SALTS INCREASE THE LEACHABILITY POTENTIAL (TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES, EPA/540/2-88/004 SEPT 1988). MIDCO II SUBSURFACE MATERIALS CONTAIN HALIDES, AND ELEVATED ZINC, MANGANESE, COPPER AND LEAD. MIDCO II DIFFERS FROM MIDCO I IN THAT MIDCO II DOES NOT CONTAIN THE SAME HIGH CONCENTRATIONS OF SEMIVOLATILE COMPOUNDS AND CYANIDE.

IN ADDITION, THE LONG TERM INTEGRITY OF THE SOLIDIFIED MATERIAL IS NOT WELL DOCUMENTED BECAUSE FEW PROJECTS HAVE BEEN IN PLACE FOR LONG PERIODS OF TIME. THIS IS OF CONCERN BECAUSE ORGANIC CONSTITUENTS ARE USUALLY NOT CONSIDERED TO BE TREATED BY THIS PROCESS BUT ONLY ENCAPSULATED. THERE IS VERY LITTLE DATA AVAILABLE ON THE APPLICABILITY OF S/S TO CYANIDE WASTES. IN ONE STUDY, THE MOBILITY OF ARSENIC WAS INCREASED BY ORDERS OF MAGNITUDE BY THE S/S. CHROMIUM AND ARSENIC ARE DIFFICULT TO SOLIDIFY AND MAY REQUIRE SPECIALIZED BINDERS. ORGANIC LEAD MAY NOT BE EFFECTIVELY TREATED BY S/S (FR, VOL 54, NO 7, PP 1098, 1099).

THEREFORE, US EPA CAN NOT BE SURE HOW SUCCESSFUL S/S WILL BE AT MIDCO II UNTIL TREATABILITY TESTS ARE COMPLETED. THESE TESTS ARE BEING INITIATED. IN ADDITION, TREATABILITY TESTS ARE NEEDED TO DETERMINE THE PROPER FORMULATION FOR THE SOLIDIFICATION REAGENTS.

4. FINAL SITE COVER:

IF THE SUBSURFACE MATERIALS ARE EXCAVATED, RCRA HAZARDOUS WASTE REGULATIONS BECOME APPLICABLE, AND THE FINAL SITE COVER MUST MEET RCRA LANDFILL CLOSURE REQUIREMENTS, UNLESS THE WASTE IS DELISTED PURSUANT TO 40 CFR 260.22. HOWEVER, RCRA DOES NOT PRESENTLY UTILIZE LEACH TESTING PROCEDURES IN THE DELISTING OF ORGANIC COMPOUNDS. THE FINAL SITE COVER MUST ALSO PROTECT THE SOLIDIFIED MATERIAL FROM DEGRADATION DUE TO ENVIRONMENTAL FACTORS SUCH AS ACID RAIN AND THE FREEZE-THAW CYCLE.

IF IN-SITU MIXING IS USED, RCRA LANDFILL CLOSURE REQUIREMENTS ARE NOT APPLICABLE. HOWEVER, THESE REQUIREMENTS MAY BE CONSIDERED RELEVANT AND APPROPRIATE BY US EPA DEPENDING ON THE RESULTS OF THE TREATABILITY STUDY. AT A MINIMUM, THE COVER MUST PROTECT THE SOLIDIFIED MATERIAL FROM ENVIRONMENTAL DEGRADATION, MINIMIZE MAINTENANCE, PROMOTE DRAINAGE, AND MINIMIZE EROSION.

5. GROUND WATER AND ACCESS:

GROUND WATER USAGE RESTRICTIONS, WELL CONNECTIONS, DEED RESTRICTIONS, ACCESS RESTRICTIONS AND MONITORING WOULD BE IMPLEMENTED AS IN ALTERNATIVE 5A. THIS ALTERNATIVE WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER REGULATIONS.

ALTERNATIVE 5G: IN-SITU VITRIFICATION

IN THIS THERMAL TREATMENT PROCESS, A SQUARE ARRAY OF FOUR ELECTRODES ARE INSERTED INTO THE GROUND TO THE DESIRED TREATMENT DEPTH OF 4.5 FEET. A CONDUCTIVE MIXTURE OF FLAKED GRAPHITE AND GLASS FRIT IS PLACED AMONG THE ELECTRODES AS A PATH FOR THE CURRENT. VOLTAGE IS APPLIED TO THE ELECTRODES TO ESTABLISH A CURRENT IN THE STARTER PATH. THE RESULTANT POWER HEATS THE STARTER PATH AND SURROUNDING SOIL UP TO 3600 DEGREES F. THE SOIL BECOMES MOLTEN AT TEMPERATURES BETWEEN 2000 DEGREES AND 2500 DEGREES F. AS THE VITRIFIED ZONE GROWS IT INCORPORATES NON-VOLATILE ELEMENTS AND DESTROYS ORGANIC COMPOUNDS BY PYROLYSIS. PYROLYZED PRODUCTS MOVE TO THE SURFACE WHERE THEY COMBUST. A HOOD OVER THE PROCESS COLLECTS OFF-GASES FOR TREATMENT. THE HOOD REMAINS OVER THE MELT UNTIL GASSING STOPS, IN APPROXIMATELY FOUR DAYS. THUS, TWO HOODS ARE REQUIRED FOR SEQUENTIAL BATCH PROCESSING. THE VITRIFIED MASS IS LEFT IN PLACE AND ANY SUBSIDENCE IS BACKFILLED WITH CLEAN FILL AND SEEDED. IN ADDITION, CONTAMINATED SEDIMENTS WOULD BE SCRAPED AND TRANSPORTED TO THE SITE FOR VITRIFICATION.

THE ADVANTAGES OF IN-SITU VITRIFICATION INCLUDE THAT EXCAVATION IS NOT REQUIRED (EXCEPT FOR SURFACE SEDIMENTS, WHICH WOULD BE SCRAPED UP AND CONSOLIDATED ON-SITE FOR VITRIFICATION), AIR EMISSIONS ARE CONTROLLED IN PLACE, ORGANIC COMPOUNDS ARE DESTROYED AND INORGANIC COMPOUNDS ARE INCORPORATED INTO A GLASSY SOLID MATRIX RESISTANT TO LEACHING AND MORE DURABLE THAN GRANITE OR MARBLE (TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES, EPA/540/2-88/004, SEPT. 1988).

DISADVANTAGES OF IN-SITU VITRIFICATION INCLUDE THAT ALTHOUGH IT HAS BEEN TESTED IN PILOT STUDIES, IT HAS NOT BEEN DEMONSTRATED IN A FULL SCALE COMMERCIAL APPLICATION. IN ADDITION, THE COMMERCIAL AVAILABILITY OF THE EQUIPMENT IS LIMITED. THE PRESENCE OF GROUND WATER ONLY FIVE FEET BELOW THE SURFACE SEVERELY LIMITS THE ECONOMIC PRACTICABILITY BECAUSE OF THE ENERGY EXPENDED IN DRIVING OFF WATER. THE PRESENCE OF BURIED METALS AND COMBUSTIBLE SOLIDS BELOW THE SURFACE MAY ALSO CAUSE PROBLEMS IN THE OPERATION (TECHNOLOGY SCREENING GUIDE

FOR TREATMENT OF CERCLA SOILS AND SLUDGES, EPA/540/2-88/004, SEPT 1988).

BECAUSE THE ORGANIC COMPOUNDS ARE DESTROYED AND INORGANIC COMPOUNDS INCORPORATED INTO A SOLID MASS RESISTANT TO LEACHING, IT IS EXPECTED THAT THE TREATED MATERIAL WILL BE DELISTABLE. IF TESTS SHOW THAT THE RESIDUE IS DELISTABLE, ONLY A SOIL COVER WOULD BE PLACED OVER THE SITE.

GROUND WATER USAGE RESTRICTIONS, WELL CONNECTIONS, DEED RESTRICTIONS, ACCESS RESTRICTIONS AND MONITORING WOULD BE IMPLEMENTED AS IN ALTERNATIVE 5A. THIS ALTERNATIVE WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER REGULATIONS.

ALTERNATIVE 6: CONTAINMENT WITH SOIL VAPOR EXTRACTION AND SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE CONTAINMENT MEASURES IN ALTERNATIVE 3. THE ADVANTAGE OF THIS ALTERNATIVE OVER ALTERNATIVE 3 ALONE IS THAT THE RISKS FROM RESIDUAL SUBSURFACE SOIL CONTAMINATION WITHIN THE CONTAINMENT BARRIER WOULD BE NEARLY ELIMINATED. THE CONTAMINANTS IN THE GROUND WATER WOULD REMAIN BUT THEY WOULD BE CONTAINED WITHIN THE SLURRY WALL.

SHOULD THE SLURRY WALL FAIL, THE GROUND WATER IN THE AREA SHOWN IN FIGURE 13 MAY EVENTUALLY BE AFFECTED. ALTHOUGH THE CONTAMINATION MAY EVENTUALLY ATTENUATE, THE RISKS FROM INGESTION OF GROUND WATER ON THE SITE ITSELF WOULD REMAIN VERY HIGH FOR A LONG TIME.

IF SUCCESSFUL, THE S/S PROCESS WOULD NEARLY ELIMINATE THE REMAINING RISKS DUE TO THE SOURCE.

ALTERNATIVE 7: GROUND WATER PUMPING AND DEEP WELL INJECTION WITH SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE GROUND WATER TREATMENT MEASURES IN ALTERNATIVE 4A.

AT THE CONCLUSION OF THIS ACTION, THE SITE WOULD BE CLOSE TO MEETING RCRA CLEAN CLOSURE REQUIREMENTS. HOWEVER, LONG-TERM MONITORING AND MAINTENANCE WOULD BE REQUIRED BECAUSE THE LONG-TERM EFFECTIVENESS OF S/S IS NOT WELL DOCUMENTED.

ALTERNATIVE 8: GROUND WATER PUMPING, TREATMENT AND DEEP WELL INJECTION WITH SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE GROUND WATER TREATMENT MEASURES IN ALTERNATIVE 4C.

AT THE CONCLUSION OF THIS ACTION, THE SITE WOULD BE CLOSE TO MEETING RCRA CLEAN CLOSURE REQUIREMENTS. HOWEVER, LONG-TERM MONITORING WOULD BE REQUIRED BECAUSE THE LONG-TERM EFFECTIVENESS OF S/S IS NOT WELL DOCUMENTED.

ALTERNATIVE 9: GROUND WATER PUMPING AND EVAPORATION WITH SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE GROUND WATER TREATMENT MEASURES IN ALTERNATIVE 4E.

AT THE CONCLUSION OF THIS ACTION, THE SITE WOULD BE CLOSE TO MEETING RCRA CLEAN CLOSURE REQUIREMENTS. HOWEVER, LONG-TERM MONITORING WOULD BE REQUIRED BECAUSE THE LONG-TERM EFFECTIVENESS OF S/S IS NOT WELL DOCUMENTED.

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IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

IN SELECTING THE FINAL REMEDIAL ACTIONS FOR SUPERFUND SITES, US EPA CONSIDERS THE FOLLOWING NINE CRITERIA:

1. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT: ADDRESSES WHETHER OR NOT A REMEDY PROVIDES ADEQUATE PROTECTION, AND DESCRIBES HOW RISKS ARE ELIMINATED, REDUCED OR CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL CONTROLS.
2. COMPLIANCE WITH ARARS: ADDRESSES WHETHER OR NOT A REMEDY WILL MEET

ALL OF THE APPLICABLE OR RELEVANT AND APPROPRIATE (ARARS) REQUIREMENTS OF OTHER ENVIRONMENTAL STATUTES AND/OR PROVIDE GROUNDS FOR INVOKING A WAIVER.

3. LONG-TERM EFFECTIVENESS AND PERMANENCE: REFERS TO THE ABILITY OF A REMEDY TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME ONCE CLEANUP GOALS HAVE BEEN MET.
4. REDUCTION OF TOXICITY, MOBILITY, OR VOLUME (TMV): IS THE ANTICIPATED PERFORMANCE OF THE TREATMENT TECHNOLOGIES A REMEDY MAY EMPLOY.
5. SHORT-TERM EFFECTIVENESS: INVOLVES THE PERIOD OF TIME NEEDED TO ACHIEVE PROTECTION AND ANY ADVERSE IMPACTS ON HUMAN HEALTH AND THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION PERIOD UNTIL CLEANUP GOALS ARE ACHIEVED.
6. IMPLEMENTABILITY: IS THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF A REMEDY, INCLUDING THE AVAILABILITY OF GOODS AND SERVICES NEEDED TO IMPLEMENT THE CHOSEN SOLUTION.
7. COST: INCLUDES CAPITAL AND OPERATION AND MAINTENANCE COSTS.
8. SUPPORT AGENCY ACCEPTANCE: INDICATES WHETHER, BASED ON ITS REVIEW OF THE RI/FS AND PROPOSED PLAN, THE STATE AGENCY (THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT) CONCURS, OPPOSES, OR HAS NO COMMENT ON THE PREFERRED ALTERNATIVE.
9. COMMUNITY ACCEPTANCE: WILL BE ASSESSED FROM THE PUBLIC COMMENTS RECEIVED.

THESE NINE CRITERIA INCORPORATE FACTORS REQUIRED TO BE ADDRESSED IN THE REMEDY SELECTION PROCESS IN SARA SECTION 121.

A COMPARISON OF THE FOURTEEN ALTERNATIVES USING THE NINE CRITERIA IS INCLUDED IN TABLES 10, 11 AND 12. A COMPARISON OF COSTS AMONG THE FOURTEEN ALTERNATIVES IS IN TABLE 13. TABLE 14 COMPARES SOME MAJOR FACTORS CONSIDERED IN THE EFFECTIVENESS EVALUATION AMONG THE FOURTEEN ALTERNATIVES. THESE TABLES ARE INCLUDED IN THE APPENDIX.

THE NO-ACTION ALTERNATIVE (1) IS UNACCEPTABLE BECAUSE ARARS FOR GROUNDWATER AND SURFACE WATERS WOULD BE EXCEEDED AND HUMAN HEALTH AND ENVIRONMENTAL RISKS FROM CONTINUED AIR EMISSIONS AND GROUNDWATER MIGRATION WILL BE UNACCEPTABLE.

ALTERNATIVES THAT ADDRESS ONLY THE SOURCE (ALTERNATIVES 2, 5A, 5C, AND 5G) ARE UNACCEPTABLE BECAUSE ALTHOUGH GROUNDWATER AND SURFACE WATER CONTAMINATION MAY EVENTUALLY ATTENUATE, THIS WILL TAKE MANY YEARS (ESTIMATE 107-175 YEARS). IN THE MEANTIME, ARARS FOR THE GROUNDWATER AND SURFACE WATER WOULD BE EXCEEDED, THE GROUNDWATER PLUME WOULD EVENTUALLY AFFECT A LARGE AREA, AND BIOTA MAY BE ADVERSELY AFFECTED BY GROUNDWATER RECHARGE TO SURFACE WATERS AND AIR EMISSIONS.

THE CONTAINMENT ALTERNATIVES 3 AND 6 WOULD PROVIDE PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT FOR AS LONG AS THE SITE CAP AND SLURRY WALL ARE MAINTAINED. HOWEVER, THE HIGH SALT AND ORGANIC CONCENTRATIONS MAY AFFECT THE PERMEABILITY OF THE SLURRY WALL, RESULTING IN THE NEED TO REPLACE IT IN THE LONG TERM. IF FUTURE DEVELOPMENT OCCURS OR THE CAP OR SLURRY WALL ARE DAMAGED, THE RESULTING HEALTH RISKS MAY BE SIMILAR TO NO ACTION FOR ALTERNATIVE 3, AND TO ALTERNATIVES ADDRESSING ONLY THE SOURCE FOR ALTERNATIVE 6. COSTS FOR REMEDIATING FAILURE WOULD BE SIMILAR TO BUT HIGHER THEN THE ORIGINAL INSTALLATION. IN THAT CASE, THE TOTAL COST FOR A CONTAINMENT ALTERNATIVE WOULD BE SIMILAR TO THE COST FOR REMEDIAL ACTIONS THAT TREAT BOTH THE SOURCE AND THE GROUND WATER.

ALTERNATIVES THAT INCLUDE ONLY TREATMENT OF THE GROUND WATER (4A, 4C, 4E) WOULD ATTAIN A CONSIDERABLE DEGREE OF PERMANENT PROTECTION. CONTAMINANTS PRESENTLY IN THE GROUND WATER AND CONTAMINANTS THAT ARE FLUSHED INTO THE GROUND WATER WOULD BE REDUCED IN TOXICITY, MOBILITY, AND VOLUME (TMV) BY OPERATION OF THE GROUND WATER TREATMENT SYSTEM OVER A LONG PERIOD OF TIME. THE SITE COVER AND ACCESS RESTRICTIONS WOULD PROTECT AGAINST ON-SITE DIRECT INGESTION AND DIRECT CONTACT RISKS.

AT THE COMPLETION OF THE GROUND WATER ACTION, RESIDUAL CONTAMINATION WILL REMAIN UNDER THE SITE COVER, ALTHOUGH IT WILL BE REDUCED FROM THE PRESENT CONDITIONS. IT IS UNCERTAIN WHAT RESIDUAL RISKS WILL REMAIN. IT IS POSSIBLE THAT MOBILE CONTAMINANTS WILL REMAIN UNDER THE COVER AFTER COMPLETION OF THE GROUND WATER TREATMENT ACTIONS. IF THE COVER IS SUBSEQUENTLY DISTURBED OR DEGRADED, THESE RESIDUALS WILL AGAIN CAUSE GROUND WATER CONTAMINATION. EVEN IF RELATIVELY MOBILE COMPONENTS, SUCH AS VOLATILE ORGANIC COMPOUNDS AND CYANIDE ARE FLUSHED FROM THE SOIL, THE RESIDUAL RISKS DUE TO DIRECT INGESTION IN CASE OF FUTURE DEVELOPMENT WOULD BE: 2.7×10^{-4} LIFETIME CARCINOGENIC RISK DUE TO ARSENIC, AND A CHRONIC NON-CARCINOGENIC INDEX OF 2.8. IN ADDITION SUBCHRONIC RISKS FROM COPPER WOULD LIKELY REMAIN. IN ADDITION, ARSENIC, LEAD AND CHROMIUM ARE PRESENT IN SOME OF THE SUBSURFACE MATERIAL AT CONCENTRATIONS SIMILAR TO THOSE IN SOME LISTED HAZARDOUS WASTES, FOR WHICH TREATMENT IS REQUIRED PRIOR TO LAND DISPOSAL PURSUANT TO 40 CFR 268 (SEE TABLE 9).

FOR THESE REASONS, AN ALTERNATIVE THAT COMBINES A SOURCE TREATMENT MEASURE WITH A GROUND WATER TREATMENT MEASURE IS NEEDED. S/S WOULD ADDRESS ALL RISKS DUE TO THE SOURCE IF IT IS SUCCESSFUL. THE EFFECTIVENESS OF S/S AT MIDCO II WOULD BE EVALUATED BY TREATABILITY TESTS PRIOR TO ITS IMPLEMENTATION.

COMPARED TO S/S, INCINERATION FOLLOWED BY S/S WOULD MORE RELIABLY TREAT THE ORGANIC COMPOUNDS. HOWEVER, INCINERATION IS CONSIDERABLY MORE EXPENSIVE THAN S/S BY ITSELF, AND, IF S/S IS SUCCESSFUL, INCINERATION WOULD DO LITTLE TO FURTHER REDUCE RISKS.

VITRIFICATION, IF IT WORKED, WOULD MORE RELIABLY ADDRESS BOTH THE ORGANIC AND INORGANIC CONTAMINANTS. IT ALSO TREATS BOTH ORGANIC AND INORGANIC COMPOUNDS IN ONE OPERATION, WHICH IS AN ADVANTAGE. HOWEVER, THERE IS A LARGE DEGREE OF UNCERTAINTY ABOUT WHETHER VITRIFICATION IS PRACTICAL AT THIS SITE BECAUSE OF THE HIGH WATER TABLE. IN ADDITION, IT IS ESTIMATED TO BE CONSIDERABLY MORE EXPENSIVE THAN S/S AND, IF S/S IS SUCCESSFUL, WOULD DO LITTLE TO FURTHER REDUCE RISKS.

ALL THE GROUND WATER TREATMENT ALTERNATIVES WOULD RESULT IN ATTAINING ARARS AND PROVIDING LONG-TERM PROTECTION OF THE CALUMET AQUIFER AT THE SITE WHEN COMBINED WITH A SOURCE TREATMENT ALTERNATIVE. THEY DIFFER ONLY IN THEIR METHOD OF TREATMENT AND DISPOSAL OF THE HIGHLY SALINE CONTAMINATED GROUND WATER. THE TREATMENT AND DEEP WELL INJECTION ALTERNATIVE (4C) MAY SUBSTANTIALLY REDUCE TMV OF CONTAMINANTS IN THE GROUND WATER PRIOR TO DEEP WELL INJECTION.

ORGANIC COMPOUNDS WOULD BE REMOVED BY STRIPPING AND CARBON ABSORPTION. IF RESIDUALS FROM THIS TREATMENT ARE INCINERATED, THIS WOULD PROVIDE PERMANENT TREATMENT OF THESE CONTAMINANTS. IF THEY ARE LANDFILLED, THE DISPOSAL MAY NOT BE CONSIDERED ANY MORE PERMANENT THAN DEEP WELL INJECTION WITHOUT TREATMENT. IF CYANIDE TREATMENT IS REQUIRED, A CHLORINATION PROCESS MAY BE USED, WHICH SHOULD PERMANENTLY DESTROY THE CYANIDE. METALS MAY BE REMOVED BY PRECIPITATION. THE METALS SLUDGE WOULD BE LANDFILLED BUT MAY REQUIRE SOLIDIFICATION FIRST. THIS DISPOSAL MAY NOT BE CONSIDERED MORE PERMANENT THAN DEEP WELL INJECTION WITHOUT TREATMENT.

THE EVAPORATION ALTERNATIVE (4E) WOULD REDUCE THE VOLUME OF ALL CONTAMINANTS AND THE TOXICITY OF CONTAMINANTS IN THE BLOW DOWN BY INCINERATION. HOWEVER, EXTENSIVE TREATMENT OF THE SALT CAKE WOULD LIKELY BE REQUIRED PRIOR TO LAND DISPOSAL UNDER THE RCRA LAND DISPOSAL RESTRICTIONS. IF SUCH TREATMENT IS NOT REQUIRED, ALTERNATIVE 4E WOULD INCLUDE DISPOSAL OF SIGNIFICANT QUANTITIES OF HAZARDOUS WASTES IN OFF-SITE LANDFILLS.

THE DEEP WELL INJECTION WITHOUT TREATMENT ALTERNATIVE (4A) WOULD NOT REDUCE TMV OF CONTAMINANTS IN THE GROUND WATER. HOWEVER, IF A PETITION TO ALLOW LAND DISPOSAL IS APPROVED BY US EPA, THIS ALTERNATIVE SHOULD PROVIDE PERMANENT HUMAN HEALTH AND ENVIRONMENTAL PROTECTION SINCE THE PETITION MUST DEMONSTRATE THAT THERE WILL BE NO MIGRATION FROM THE INJECTION ZONE WHILE THE WASTES REMAIN HAZARDOUS. IN ADDITION, ALTERNATIVE 4A IS CONSIDERABLE LESS EXPENSIVE THAN ALTERNATIVE 4C.

#SR

X. THE SELECTED REMEDY

US EPA SELECTS EITHER ALTERNATIVE 7 OR 8 FOR IMPLEMENTATION AT MIDCO II. THESE ALTERNATIVES ARE DESCRIBED IN SECTIONS XIII AND IX. ALTERNATIVE 7 WILL BE IMPLEMENTED IF A PETITION TO ALLOW INJECTION OF WASTE PROHIBITED UNDER 40 CFR PART 148 SUBPART B IS APPROVED BY US EPA. IN THIS CASE, THE PERMANENCE OF THE REMEDIAL ACTION WOULD BE CONSIDERED EQUIVALENT TO ALTERNATIVE 8, AND ALTERNATIVE 7 IS LESS EXPENSIVE. IF A PETITION IS NOT APPROVED, ALTERNATIVE 8 WILL BE IMPLEMENTED.

THE SELECTED ALTERNATIVE WILL ALSO INCLUDE SITE ACCESS RESTRICTIONS AND IMPOSITION OF DEED RESTRICTIONS, AS APPROPRIATE. EITHER ALTERNATIVE WILL INCLUDE TREATMENT OF THE SOURCE BY S/S. THIS IS THE LEAST EXPENSIVE ALTERNATIVE THAT WILL PERMANENTLY REDUCE TMV OF THE SOURCE AND BE FULLY PROTECTIVE OF HUMAN HEALTH AND THE

ENVIRONMENT. HOWEVER, IMPLEMENTATION OF THIS SOURCE REMEDIAL ACTION DEPENDS ON THE RESULTS OF THE TREATABILITY TESTS FOR S/S. IF THE TREATABILITY TESTS SHOW THAT S/S WILL NOT PROVIDE A SIGNIFICANT REDUCTION IN MOBILITY OF THE HAZARDOUS SUBSTANCES OF CONCERN, THE ROD WILL BE REOPENED AND A DIFFERENT SOURCE CONTROL MEASURE WILL BE SELECTED. A MORE DETAILED COST BREAKDOWN FOR THESE ALTERNATIVES IS IN TABLES 15 AND 16 IN THE APPENDIX.

CLEAN UP ACTION LEVELS (CALs):

SOIL CLEAN UP ACTION LEVELS:

ALL SUBSURFACE MATERIALS AFFECTED BY THE SITE OR BY MIDCO OPERATIONS THAT EXCEED ANY OF THE FOLLOWING RISK BASED LEVELS WILL BE TREATED:

CUMULATIVE LIFETIME CARCINOGENIC RISK	= 1×10^{-5}
CUMULATIVE CHRONIC NONCARCINOGENIC INDEX	= 1.0
SUBCHRONIC RISK INDEX	= 1.0

GROUND WATER CLEAN UP ACTION LEVELS:

ALL PORTIONS OF THE CALUMET AQUIFER AFFECTED BY THE SITE OR BY MIDCO OPERATIONS THAT EXCEED ANY OF FOLLOWING RISK-BASED LEVELS WILL BE RECOVERED AND TREATED (EXCEPT AS PROVIDED FOR IN THE SUBSEQUENT DISCUSSION). THE GROUND WATER PUMPING, TREATMENT AND DISPOSAL SYSTEM SHALL CONTINUE TO OPERATE UNTIL THE HAZARDOUS SUBSTANCES IN ALL PORTIONS OF THE CALUMET AQUIFER AFFECTED BY THE SITE OR BY MIDCO OPERATIONS ARE REDUCED BELOW EACH OF THESE RISK-BASED LEVELS (EXCEPT AS PROVIDED FOR IN THE SUBSEQUENT DISCUSSION). APPLYING THE CALS THROUGHOUT THE CONTAMINATED PLUME IS CONSISTENT WITH FR, VOL 53, NO 245, P 51426.

CUMULATIVE LIFETIME CARCINOGENIC RISK	= 1×10^{-5}
CUMULATIVE NONCARCINOGENIC INDEX	= 1.0
SUBCHRONIC RISK	= 1.0
PRIMARY MCLS (40 CFR 141)	
CHRONIC AWQC FOR PROTECTION OF AQUATIC LIFE MULTIPLIED BY A FACTOR	
3.6	

EVALUATION OF ATTAINMENT OF CALS:

THE RISK LEVELS WILL BE CALCULATED FROM THE SOIL AND GROUND WATER ANALYTICAL RESULTS USING THE ASSUMPTIONS LISTED IN TABLES 2, 3, 4 AND 5 IN THE APPENDIX (EXCEPT THAT IN PLACE OF THE AVERAGE SITE CONCENTRATION, ACTUAL MEASURED SOIL AND GROUND WATER CONCENTRATIONS IN EACH SAMPLE LOCATION WILL BE USED, AND SOIL INGESTION RATES FOR CHRONIC EXPOSURES OF 0.2 GRAM PER DAY FOR AGES 1-6 AND 0.1 GRAM PER DAY FOR OLDER AGE GROUPS WILL BE USED), THE PROCEDURES IN THE SUPERFUND PUBLIC HEALTH EVALUATION MANUAL AND US EPA'S MOST RECENTLY PUBLISHED CARCINOGENIC POTENCY FACTORS AND REFERENCE DOSES.

FOR INORGANIC COMPOUNDS IN GROUND WATER, THE ANALYTICAL RESULTS FROM FILTERED SAMPLES WILL BE USED. THE ANALYTICAL PROCEDURES WILL AT LEAST REACH THE ANALYTICAL DETECTION LIMITS LISTED IN TABLES 17 AND 18 IN THE APPENDIX. CONSTITUENTS THAT ARE NOT DETECTED SHALL NOT BE INCLUDED IN RISK CALCULATIONS. CONSTITUENTS THAT ARE DETECTED BELOW BACKGROUND CONCENTRATIONS IDENTIFIED IN TABLES 17 AND 18 SHALL NOT BE INCLUDED IN THE RISK CALCULATIONS.

IF ONLY ONE CONSTITUENT IS DETECTED IN GROUND WATER AT A CONCENTRATION THAT IS CALCULATED TO POTENTIALLY CAUSE A LIFETIME, INCREMENTAL CARCINOGENIC RISK OF 1×10^{-5} OR GREATER, AND AN MCL HAS BEEN PROMULGATED FOR THIS CONSTITUENT PURSUANT TO 40 CFR 141, THEN THE MCL WILL BE THE CAL FOR THAT CONSTITUENT. IN ADDITION, THAT CONSTITUENT WILL NOT BE USED IN THE CUMULATIVE RISK CALCULATION.

JUSTIFICATION FOR USE OF 10^{-5} RISK LEVEL:

USE OF THE 1×10^{-5} LIFETIME, CUMULATIVE CARCINOGENIC RISK LEVEL AS OPPOSED TO THE 1×10^{-6} LEVEL IS CONSIDERED MORE APPROPRIATE FOR A SOIL CAL FOR THIS SITE BECAUSE RESIDENTIAL DEVELOPMENT IS UNLIKELY BECAUSE OF THE INDUSTRIAL USAGE OF THE AREA.

USE OF THE 1×10^{-5} LIFETIME, CUMULATIVE CARCINOGENIC RISK LEVEL IS CONSIDERED MORE APPROPRIATE FOR THE GROUND WATER CAL AS OPPOSED TO THE 1×10^{-6} LEVEL BECAUSE THE CALUMET AQUIFER IS LITTLE USED IN THE VICINITY OF THE SITE, AND BECAUSE THERE ARE MULTIPLE CONTAMINANT SOURCES THAT ARE AFFECTING THE CALUMET

AQUIFER IN THE VICINITY OF THE SITE. IN ADDITION, THE 10^{-6} LEVEL IS GENERALLY WELL BELOW THE ANALYTICAL DETECTION LIMITS FOR THE CONSTITUENTS OF CONCERN.

CRITERIA FOR CONTROL OF AIR EMISSIONS:

EACH SEPARATE SOURCE OF AIR EMISSIONS SHALL BE CONTROLLED TO PREVENT EXPOSURES TO THE NEAREST RESIDENT AND WORKERS ON ADJACENT PROPERTIES FROM CAUSING AN ESTIMATED CUMULATIVE, INCREMENTAL, LIFETIME CARCINOGENIC RISK EXCEEDING 1×10^{-7} . SINCE THERE ARE MULTIPLE OPERATIONS THAT CAUSE AIR EMISSIONS, EACH MUST BE CONTROLLED TO THE 1×10^{-7} CARCINOGENIC RISK LEVEL TO ASSURE THAT THE TOTAL RISK WILL BE LESS THAN 1×10^{-6} . THE FOLLOWING OPERATIONS WILL BE CONSIDERED SEPARATE SOURCES:

1. SUBSURFACE SOIL EXCAVATION AND HANDLING;.
2. EMISSIONS FROM S/S;
3. EMISSIONS FROM GROUND WATER TREATMENT.

THE RISK LEVELS WILL BE CALCULATED USING CONSERVATIVE ASSUMPTIONS, THE PROCEDURES IN THE US EPA PUBLIC HEALTH EVALUATION MANUAL AND EXPOSURE ASSESSMENT MANUAL, AND THE MOST RECENT US EPA PUBLISHED CARCINOGENIC POTENCY FACTOR. THE EMISSIONS MUST ALSO BE CONTROLLED TO PREVENT ANY NON-CARCINOGENIC RISK EITHER ON-SITE OR OFF-SITE. FUGITIVE DUST MUST BE CONTROLLED IN COMPLIANCE WITH STATE OF INDIANA REQUIREMENTS.

THE SELECTED REMEDIAL ACTIONS WILL BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, WILL ATTAIN APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE REQUIREMENTS AND ARE COST EFFECTIVE. THE REMEDY SATISFIES THE STATUTORY PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT THAT REDUCES TOXICITY, MOBILITY OR VOLUME AS A PRINCIPAL ELEMENT AND UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE.

THE STATE OF INDIANA IS EXPECTED TO CONCUR WITH THE SELECTED REMEDIAL ACTIONS. ALTHOUGH THERE IS SOME PUBLIC CONCERN ABOUT THE DEEP WELL INJECTION OPERATION, IT IS BELIEVED THAT THE PROTECTIVE MEASURES REQUIRED IN US EPA'S UNDERGROUND INJECTION CONTROL PROGRAM COUPLED WITH SOURCE (SOIL) TREATMENT PROVIDE A MORE ACCEPTABLE TECHNOLOGY FOR THE COMMUNITY THAN THE FURTHER DEGRADATION OF THE EXISTING CALUMET AQUIFER OR THE GRAND CALUMET RIVER.

BECAUSE THE REMEDY WILL RESULT IN HAZARDOUS SUBSTANCES REMAINING ON-SITE ABOVE HEALTH-BASED LEVELS, A REVIEW WILL BE CONDUCTED WITHIN FIVE YEARS AFTER COMMENCEMENT OF REMEDIAL ACTIONS TO ENSURE THAT THE REMEDY CONTINUES TO PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

TABLE 13

MIDCO I
ESTIMATED COSTS IN MILLIONS OF DOLLARS
AND TIME TO IMPLEMENT

COMPLETE ALTERNATIVE	PRESENT WORTH	CAPITAL COST	COST	YEARS TO ANNUAL O&M DESIGN AND CONSTRUCT	YEARS TO ACTION
1. NO ACTION	0	0	0	0	0
2. CAP	3.4	2.0	0.15	2	1
3. CONTAINMENT	4.7	3.2	0.16	3	2

REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER

4A. DEEP WELL	5.5	3.8	0.19	4	30
4C. TREAT AND DEEP WELL	8.8	3.9	0.53	3	30
4E. EVAPORATION	6.5	2.3	0.45	3	30

REMEDIES THAT DIRECTLY ADDRESS SOURCE

5A. LANDFILL	9.7	8.3	0.15	2	2
5C. INCINERATION	13.6	12.2	0.15	4	4
5E. SOLIDIFICATION	7.6	6.2	0.15	2	2
5G. VITRIFICATION	10.2	8.9	0.15	3	3

REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER

6. COMBINES 5E WITH 3	10.2	8.7	0.16	3	3
7. COMBINES 5E WITH 4A	10.7	9.0	0.19	4	30
8. COMBINES 5E12 WITH 4C	14.0	9.1	0.53	4	30
9. COMBINES 5E1 WITH 4E	11.8	7.5	0.45		4
30					

- EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.
- COSTS ARE FOR TREATMENT TO DRINKING WATER STANDARDS PRIOR TO DEEP WELL INJECTION. IF ONLY TREATMENT TO LAND DISPOSAL RESTRICTION TREATMENT STANDARDS ARE REQUIRED, COST ESTIMATE IS \$800,000 LESS.

MIDCO I
TABLE OF EFFECTIVENESS AND IMPLEMENTABILITY

ALTERNATIVE	WILL CONTAMINANTS MIGRATE OFF-SITE IN GROUND WATER?	WILL ACTION RESULT IN NON-COMPLIANCE WITH STATE OR FEDERAL STANDARDS?
-------------	--------------------------------------------------------	-----------------------------------------------------------------------------

1. NO ACTION	YES	YES
2. CAP	YES	YES
3. CONTAINMENT	NO	NO

REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER

4A. DEEP WELL	NO	NO
4C. TREAT AND DEEP WELL	NO	NO
4E. EVAPORATION	NO	NO

REMEDIES THAT DIRECTLY ADDRESS SOURCE

5A. LANDFILL*	YES	YES
5C. INCINERATION*	YES	YES
5E. SOLIDIFICATION*	YES	YES
5G. VITRIFICATION	YES	YES

REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER

6. (5E + 3)*	NO	NO
7. (5E + 4A)*	NO	NO
8. (5E + 4C)*	NO	NO
9. (5E + 4E)*	NO	NO

* EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.

1. HAZARDOUS WASTE DISPOSAL IN DEEP AQUIFER.
2. SMALL AMOUNTS OF PRECIPITATED METALS AND SPENT CARBON MAY BE LANDFILLED.
3. SALT CAKE CONTAMINATED WITH METALS, CYANIDE AND SOME ORGANICS WILL BE LANDFILLED. ORGANIC LIQUIDS WILL BE INCINERATED.
4. SMALL AMOUNTS OF LIQUIDS FROM IN-SITU VAPOR EXTRACTION WILL BE INCINERATED.
5. APPROVAL UNDER CERCLA IS UNLIKELY.
6. THE LONG TERM EFFECTIVENESS OF THE SLURRY WALL IS UNCERTAIN.
7. MAY BE PROBLEMS OBTAINING APPROVAL FOR DEEP WELL INJECTION.
8. GROUND WATER USAGE RESTRICTIONS DIFFICULT TO IMPLEMENT.
9. PROCEDURES ARE NOT PROVEN IN A FULL SCALE PROJECT. HIGH WATER TABLE MAY CAUSE DIFFICULTIES DURING CONSTRUCTION.

MIDCO I
TABLE OF EFFECTIVENESS AND IMPLEMENTABILITY

ALTERNATIVE	WILL CONTAMINANTS OF POTENTIAL HEALTH CONCERN REMAIN IN THE SOIL OR GROUND WATER?	WILL A SIGNIFICANT AMOUNT OF OFF-SITE HAZARDOUS WASTE DISPOSAL OCCUR?
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1. NO ACTION	YES	NO
2. CAP	YES	NO
3. CONTAINMENT	YES	NO

REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER

4A. DEEP WELL	YES	NO1
4C. TREAT AND DEEP WELL	YES	NO2
4E. EVAPORATION	YES	YES3

REMEDIES THAT DIRECTLY ADDRESS SOURCE

5A. LANDFILL*	YES	YES
5C. INCINERATION*	YES	NO4
5E. SOLIDIFICATION*	YES	NO4
5G. VITRIFICATION	YES	NO

REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER

6. (5E + 3)*	YES	NO4
7. (5E + 4A)*	NO	NO14
8. (5E + 4C)*	NO	NO42
9. (5E + 4E)*	NO	YES34

* EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.

1. HAZARDOUS WASTE DISPOSAL IN DEEP AQUIFER.
2. SMALL AMOUNTS OF PRECIPITATED METALS AND SPENT CARBON MAY BE LANDFILLED.
3. SALT CAKE CONTAMINATED WITH METALS, CYANIDE AND SOME ORGANICS WILL BE LANDFILLED. ORGANIC LIQUIDS WILL BE INCINERATED.
4. SMALL AMOUNTS OF LIQUIDS FROM IN-SITU VAPOR EXTRACTION WILL BE INCINERATED.
5. APPROVAL UNDER CERCLA IS UNLIKELY.
6. THE LONG TERM EFFECTIVENESS OF THE SLURRY WALL IS UNCERTAIN.
7. MAY BE PROBLEMS OBTAINING APPROVAL FOR DEEP WELL INJECTION.
8. GROUND WATER USAGE RESTRICTIONS DIFFICULT TO IMPLEMENT.
9. PROCEDURES ARE NOT PROVEN IN A FULL SCALE PROJECT. HIGH WATER TABLE MAY CAUSE DIFFICULTIES DURING CONSTRUCTION.

MIDCO I
TABLE OF EFFECTIVENESS AND IMPLEMENTABILITY

ARE
SIGNIFICANT
IMPLEMENTATION
PROBLEMS EXPECTED?

1. NO ACTION	YES58
2. CAP	YES58
3. CONTAINMENT	NO6

REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER

4A. DEEP WELL	NO7
4C. TREAT AND DEEP WELL	NO
4E. EVAPORATION	NO

REMEDIES THAT DIRECTLY ADDRESS SOURCE

5A. LANDFILL*	YES8
5C. INCINERATION*	YES8
5E. SOLIDIFICATION*	YES8
5G. VITRIFICATION	YES89

REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER

6. (5E + 3)*	NO
7. (5E + 4A)*	NO7
8. (5E + 4C)*	NO
9. (5E + 4E)*	NO

* EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.

1. HAZARDOUS WASTE DISPOSAL IN DEEP AQUIFER.
2. SMALL AMOUNTS OF PRECIPITATED METALS AND SPENT CARBON MAY BE LANDFILLED.
3. SALT CAKE CONTAMINATED WITH METALS, CYANIDE AND SOME ORGANICS WILL BE LANDFILLED. ORGANIC LIQUIDS WILL BE INCINERATED.
4. SMALL AMOUNTS OF LIQUIDS FROM IN-SITU VAPOR EXTRACTION WILL BE INCINERATED.
5. APPROVAL UNDER CERCLA IS UNLIKELY.
6. THE LONG TERM EFFECTIVENESS OF THE SLURRY WALL IS UNCERTAIN.
7. MAY BE PROBLEMS OBTAINING APPROVAL FOR DEEP WELL INJECTION.
8. GROUND WATER USAGE RESTRICTIONS DIFFICULT TO IMPLEMENT.
9. PROCEDURES ARE NOT PROVEN IN A FULL SCALE PROJECT. HIGH WATER TABLE MAY CAUSE DIFFICULTIES DURING CONSTRUCTION.

TABLE 9
COMPARISON OF CONCENTRATIONS OF INORGANICS IN SUBSURFACE MATERIAL
AT MIDCO I WITH CONCENTRATIONS IN LISTED HAZARDOUS WASTES (FROM
BDAT BACKGROUND DOCUMENTS FOR THE FIRST THIRD WASTES UNDER LAND BAN)

CONSTITUENT CONCENTRATIONS (MG/KG)				
SOURCE	ARSENIC	CHROMIUM	LEAD	CADMIUM
K101	590-1950			
K102	3060-8320			
K061		1730	20300	44
K046			967	
K048		0.04-3435	0.05-1250	
K049		28.9-1400	21.95-3900	
K050		11-1600		
K051		0.1-6790	0.25-2480	
K052			11-5800	
MIDCO I ON-SITE SOILS	ND-49	2.2-10200	2.8-4980	ND-12

TABLE 19

**LAND DISPOSAL RESTRICTION TREATMENT STANDARDS FOR WASTE
CATEGORIES F001, F002, F003, F005 (FROM 40 CFR 268.41)**

CONSTITUENT	CONCENTRATIONS IN EXTRACT MG/L	
	WASTEWATERS	NON-WASTEWATERS*
ACETONE	0.05	0.59
N-BUTYL ALCOHOL	5.0	5.0
CARBON DISULFIDE	1.05	4.81
CARBON TETRACHLORIDE	0.15	0.96
CHLOROBENZENE	0.15	0.05
CYCLOHEXANONE	0.125	0.75
1,2 DICHLOROBENZENE	0.65	0.125
ETHYL ACETATE	0.05	0.75
ETHYL BENZENE	0.05	0.053
ETHYL ETHER	0.05	0.75
ISOBUTANOL	5.0	5.0
METHANOL	0.25	0.75
METHYLENE CHLORIDE	0.20	0.96
METHYL ETHYL KETONE	0.05	0.75
METHYL ISOBUTYL KETONE	0.05	0.33
PYRIDINE	1.12	0.33
TETRACHLOROETHYLENE	0.079	0.05
TOLUENE	1.12	0.33
1,1,1-TRICHLOROETHANE	1.05	0.41
1,1,2-TRICHLORO-1,2,2		
TRIFLUOROETHANE	1.05	0.96
TRICHLOROETHYLENE	0.065	0.091
TRICHLOROFLOUROMETHANE	0.05	0.96
XYLENE	0.05	0.15

*A CAPACITY VARIANCE IS IN EFFECT FOR SOIL WASTE AND DEBRIS UNTIL NOVEMBER 1990.

TABLE 20

PROPOSED LAND RESTRICTION TREATMENT STANDARDS
FOR WASTE CATEGORIES F007, F008, F009,
(FROM FR, VOL, 53, NO. 7, P. 1068)

WASTEWATERS:

CONSTITUENT	TOTAL COMPOSITION (MG/L)	TCLP (MG/L)
CYANIDE (TOTAL)	12	
CYANIDE (AMENABLE)	1.3	
CHROMIUM	0.32	
LEAD	0.04	
NICKEL	0.44	

NONWASTEWATERS:

	(MG/KG)	(MG/L)
CYANIDES (TOTAL)	110	
CYANIDES (AMENABLE)	0.064	
CADIUM		0.066
CHROMIUM		5.2
LEAD		0.51
NICKEL		0.32
SILVER		0.072